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CONTENTS

	PAGE
Biological Factors affecting Family Size. F. A. E. CREW	1
Studies of the Diet of Students at Edinburgh University. A. H. KITCHIN, R. PASSMORE, M. PYKE, and G. M. WARNOCK	10
Mortality from Rheumatic Heart Disease in Children and Young Adults in England and Wales. J. KNOWELDEN	29
Review	42
Abstracts	43

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BIOLOGICAL FACTORS AFFECTING FAMILY SIZE

BY

F. A. E. CREW

Latterly much attention has been attracted, and rightly so, to the number, variety, and potency of the socio-economic factors which strongly incline married couples deliberately to restrain their fertility and thereby to limit the size of their families. A tendency to overlook a number of purely biological factors which work in the same direction is to be discerned. These latter are for the most part not under the control of the will of the individual and are as yet far beyond the powers of the medical and social sciences in application. It is not suggested that these factors, as judged by their effects, play as important a role in determining family size as do the socio-economic, or that pronatalist policies are mistaken when based on the demonstrably reasonable assumption that if only the people could be persuaded to unleash their fertility the total size of our population could easily be maintained at its present level or even enlarged. Nevertheless, it is surely desirable when population policies are being fashioned that all and not merely the more potent factors known to affect fertility shall be taken into account.

Impaired Fecundity as a Limiting Factor

As the outcome of the experience of sterility, family planning, and similar clinics and of medical practitioners and specialists, and as the result of a number of specific enquiries, there has accumulated a mass of information of a scientific kind concerning the incidence of childlessness and of small family size (one or two offspring) among long-married couples. There is general agreement concerning the following conclusions (see Lane Roberts and others, 1939; Barton and others, 1943; Engle, 1946; Editorial, *British Medical Journal*, 1946; DeLee and Greenhill, 1947; Whelpton and Kiser, 1948, for example).

Not less than 10 per cent. of all marriages in this country, as also in the United States of America, remain permanently fruitless. Matthews Duncan arrived at the same conclusion in so far as this country was concerned as long ago as 1884. This barrenness cuts right across the social stratification; it is only very exceptionally deliberate and in the overwhelming majority of instances it is due to persistent infecundity on the part of one or other of the married partners. Those who state so confidently that of the marriages initiated each year one in every ten is destined to remain permanently fruitless do not indicate the route they travelled to reach this conclusion. Nevertheless, there is much which would seem to give it credence. Thus, of all the married women (excluding the widowed and the divorced) whose deaths were registered in Scotland during 1945:

563 (25·1 per cent.) though married for 10-14 years died childless
667 (21·7 per cent.) though married for 15-19 years died childless
1,719 (19·7 per cent.) though married for 20-29 years died childless
2,163 (12·1 per cent.) though married for 30-39 years died childless

But a certain caution must be exercised when labelling a marriage as being permanently barren whilst the partners are still alive and the woman still menstruating, for in Scotland in the same year of the 88,612 women who produced offspring:

32 had their first child after 20+ years of marriage
142 had their first child after 15-19 years of marriage
444 had their first child after 10-14 years of marriage

The same caution is demanded when an unexpected first pregnancy in an ageing woman follows immediately and dramatically upon the desperate trial of some new medicament or therapeutic system or occurs as a startling sequel to the adoption of a child. However, whatever the exact proportion of permanently barren marriages may be, it remains a most disturbing and challenging thought that a very considerable number of such marriages do occur each year and that, furthermore, very large numbers of married couples, having produced one or two children, thereafter remain unable to produce any more, however ardently they may wish to do so. This lowered fecundity on the part of either the male or the female partner is responsible for the relative infertility exhibited by some 60 to 90 per cent. of small-family couples. There is much evidence, which is continually being reinforced, that after the first or second pregnancy the power of married pairs to reproduce shows a definite tendency to fall.

The ascertained and suspected causes of such

infecundity are numerous: for example, in the female, major degrees of uterine hypoplasia, cervical erosion, tuberculous endometritis and salpingitis, uterine retroflexion, occluded tubes, certain of these conditions often being the sequelae of a previous abortion or pregnancy; in the male, ozoospermia, oligozoospermia, necrozoospermia, asthenozoospermia (possibly associated with a deficiency of the enzyme hyaluronidase so that the follicle cells surrounding the ovum are not dispersed), sometimes the sequelae of cryptorchidism, mumps, gonorrhoea, or non-specific epididymitis. Of the male partners examined on account of the infertility of a married pair, at least one in five shows abnormality of the spermatozoa of one kind or another. Infrequent coitus is regarded by some as a cause of infecundity in the male and abnormal utero-tubal irritability as a cause of the same condition in the female. Inability on the part of the spermatozoa to penetrate the interface between semen and cervical mucus has been shown to be causally related to infertility (Barton and Wiesner, 1946, 1948). Hormone imbalance in either sex is commonly blamed (Christie Brown, 1948, for example). It has been suggested that antibodies can be elaborated in the blood of the female partner as a reaction to hyaluronidase and that these antibodies can prevent conception by precluding the action of the enzyme upon the follicle cells (Rothschild, 1947).

Though some gynaecologists of wide experience present the view that the artificial deferment of pregnancy leads to infertility (see Siegler, 1945, for example), the great majority of studies of this matter (see Barton and others, 1943; Whelpton and Kiser, 1948; Dickinson and Morris, 1941, for example) would seem to show quite clearly that the use of contraceptive practices (other than those involving intrauterine appliances) in the earlier years of marriage has no discernible effect upon the fecundity and fertility of couples who later decide to have children.

It seems to be agreed that in a very large proportion of barren or small-family marriages no physical cause for the infertility is to be identified. It is not surprising, therefore, that attention, somewhat timid in nature, is now being paid by gynaecologists to the possibility that psychological factors are operating to a degree previously unsuspected. Thus Stallworthy (1948), having called attention to the possible significance of functional or intrinsic dysmenorrhoea, vaginal spasm, vaginismus, functional bleeding and amenorrhoea, plucks up his courage and with the air of one expecting professional ostracism as a reward for daring asks whether it is not possible that a woman may deprive herself of the conception she desires or fears because of the very strength of her desire or of her fear. Walser (1948) goes further. He records that some 30 per cent. of those who attend the sterility clinics with which he is associated show no demonstrable cause for their condition and boldly expresses the firm opinion, based on his clinical judgment, that some of these are undoubtedly childless because they are afraid.

If it is assumed that emotional disturbances can possibly find their expression in some form of functional abnormality which renders the fruitful meeting of ovum and spermatozoon unlikely, a more satisfying explanation of a number of somewhat puzzling observations can be reached. For example, Sydenham (1946) records that 53·67 per cent. of the 655 women between the ages of 15 and 45 interned by the Japanese in Hong Kong in 1942 suffered from amenorrhoea of more than three months' duration and dating from the time of the capitulation. She does not doubt that the initial cause was emotional shock. An intriguing question at once presents itself. Is such amenorrhoea associated with non-ovulation? The temperature test for ovulation applied to a series of cases of amenorrhoea caused by emotional disturbance might, as is suggested by the experience of Tomkins (1946), yield information, of great value. Bearing on this question also is the authentic account of the reproductive history of the Dutch women in 1944-45, the starvation year in the Netherlands. Clement Smith (1947) reports that during that year the conception rate underwent a sharp fall, that half the female population suffered from amenorrhoea, and that 50 per cent. of the other half menstruated very irregularly. He quite reasonably presents the view that the cause was malnutrition. It is of interest to note, however, that the stillbirth rate, the neonatal mortality rate among infants born in hospital, and the ability to breast-feed were not significantly affected. At this time Holland was an occupied country, the very atmosphere of which was rank with hatred and fear. With the rising tempo of the war the hope of liberation, long deferred, seemed almost within reach so that tortured hope battled with black despair. Surely if psychological factors can affect ovulation, the passage of the ovum onwards toward the uterus, conception, or implantation, their effects would be revealed under such circumstances. And if it be granted that psychological factors can so affect the female it becomes possible to accept the psychiatrist's teaching that the same factors may be related causally to many of the

varieties of abnormality of the male contribution to conception.

At present it would seem that general medical therapeusis can repair infertility in about one-third of the cases that present themselves for advice and treatment. It is to be expected that developments in reproductive physiology and gynaecology will soon yield added power to repair much of the infertility that is based upon developmental imperfection and to prevent much of the infertility that derives from obstetrical mischance or mismanagement. But if, as seems probable, much of the existing infertility is the expression of the action of psychological factors yielding fear or profound anxiety, the therapy demanded must be of quite another kind and must concern itself with the education of the citizen and with the cultivation of new aspirations and new loyalties. Moreover, it will become urgently necessary to enquire whether or not this impaired fertility is a phenomenon that is commonly associated with, caused by, the disharmonies which manifestly exist between the biological nature and needs of mankind and the peculiar social organizations and economic systems that civilized man has evolved; whether it is in large measure a reaction on the part of individuals and groups to conditions and circumstances in the external world that are not conducive to the maintenance of reproductive efficiency.

Genes as Limiting Factors

In forms other than man it is firmly established that fecundity rests, partly at least, on a genetic basis—there are "fertility" genes. Studies of human pedigrees yield evidence of a sort which suggests that this is also the case in the human subject (see Penrose, 1936; Gates, 1946, for example).

Reproduction implies much more than the production of a newborn child. This child must live to reproduce in its turn. There are genes that slay the individuals possessing them before the reproductive phase of life is reached or finished. The genes which are the causes of Morquio's osseous dystrophy, xeroderma pigmentosum, epidermolysis bullosa, brachyphalangy, telangiectasis, thalassemia, haemophilia, acholuric jaundice, Cooley's anaemia, Werdnig-Hoffman's progressive spinal muscular atrophy of infants, subcortical encephalopathy of Globus and Strauss, encephalitis periaxialis diffusa, Tay-Sachs' amaurotic idiocy, and glioma retinae are examples of these. By their action they tend to limit the size of a sibship. Thus haemophilia, caused by a sex-linked recessive gene, extinguishes the life of the homozygous female *in utero* and greatly shortens the postnatal life of the affected male. He rarely reaches the age of twenty-five, and the few who do and marry have but scant time to reproduce. On the average, haemophiliacs produce only about a quarter as many children as do normals. It is established (see Cappell, 1946; Race, 1948, for example) that in erythroblastosis foetalis, another disease genetically determined, the production of the maternal antibodies in response to the foetal antigens is so slow and gradual that whilst the earlier members of a sibship remain unaffected the later ones are destroyed (in the absence of appropriate therapy). Mongolism is a disease the causation of which is the interaction of the peculiar genotype of the foetus and certain peculiar conditions of its environment, the maternal organism. It is a disease which is generally exhibited by the later members of sibships and, though not in itself lethal, so handicaps its exhibitors that reproduction is impossible and life expectancy greatly reduced.

The existence of these genes is clearly demonstrated in the records of stillbirth and infant and child morbidity and mortality. From what is known concerning the prevalence and action of similar lethal and sub-lethal genes that operate during the earlier stages of embryonic life in experimental animals and plants it is safe to postulate that in man also such genes are responsible for much embryonic and early foetal death and thus for much abortion and apparent infertility. For example, Waterhouse and Hogben (1947) have offered convincing evidence that A—B—O isoimmunization is responsible for the loss of about 25 per cent. of the A children expected from marriages A × O, or about 3 per cent. of all conceptions. The action of such genes is evidenced in the non-appearance or numerical deficiency of certain expected phenotypes in sibships in pedigrees in which the abnormality figures, such non-appearance or deficiency yielding a disturbed secondary sex-ratio when a differential sex lethality is involved, as is frequently the case.

The Biological Nature of the Human Female as a Limiting Factor

The number of offspring produced at one and the same time by the female of a species must necessarily affect the total number of offspring produced by her during the whole of her life. A survey of the different species in their order of zoological classification strongly suggests that between the place of a species in the zoological scale and the number of offspring produced by the female of that species at one and the same time there exists a direct

relationship—the " higher " the species the fewer the offspring. This observation, to which there are, of course, many exceptions, has provoked much speculation. Spencer (1899), for example, made the reasonable suggestion that between the maintenance needs of the individual's own life (individuation) and the energy requirements of reproduction (genesis) there is a conflict and that the two are inversely proportional, the long-lived species being remarkable for the smallness of their litters. Wood Jones (1915) presented the argument that offspring can under certain circumstances constitute a definite handicap to their parents, interfering more or less seriously with their usual behaviour patterns. Necessarily there must be some connexion between the conditions of the habitat and the behaviour of the parents on the one hand and the reproductive behaviour of the species on the other. Only in those in which the pregnant and nursing female is not too greatly disadvantaged by carrying or rearing a large number of offspring are large litters possible, and only in those species in which the parents provide a " nursery "—a nest, a burrow—in which the young can find shelter and protection are large litters to be encountered. Marshall (1922) hazarded the suggestion that the average number of young produced at one time by the female and the average size of the individuals of the species are inversely proportional, the larger the animal the smaller the litter. Fisher (1938) introduced the notion of reproductive economy. If a species is to flourish, then, assuming that the conditions of the habitat do not change too drastically, what is required of the individuals of one generation is that they shall produce a succeeding generation at least numerically equal to their own. The well-being of a species or population can be measured by the movement of the net reproduction rate. Population size is maintained when every fecund female in one generation is represented by at least one fecund female in the next.

In general there are two ways in which population size can be maintained or increased, one extravagant, the other economical. In the first, far more than enough offspring are produced, the excess being removed by gross mortality. Thousands of ova are made available by each female for fertilization at the same time, but by no means all are fertilized. In such forms external fertilization is the rule and there is a complete disregard on the part of the parents for their offspring. The newly born young are more or less well equipped for the satisfying of their own immediate biological needs, but being unprotected they suffer great loss from mishap and they form the food supply of their own and other species. In the second, the number of ova produced at any one time by the female is reduced to the absolute minimum, fertilization is internal so that conception is made certain, and to the immature young, made precious by their very paucity, are given by their own parents great care and protection.

It is in the amalgam of all these various hypotheses that the correct explanation of all the different observations is most likely to be found. In general the larger and more complicated the creature is, the longer is the period of time demanded for its growth and differentiation. The longer this period is, the longer is the phase of immaturity and dependency of offspring upon adults of its own kind. The greater and the longer this dependency is, the fewer the offspring that can be given parental care at any one time. Parental care of the immature young can best be provided in an extra-corporeal uterus (a micro-environment equipped with facilities for protection and food supply): a nest, burrow, nursery. The fewer the offspring born at one time the fewer the ova that need to be shed. The fewer the ova, the more certain must fertilization become For the accommodation of one fertilized ovum a non-cornuate uterus suffices; for the reception of many a bicornuate uterus is required (see Wood Jones, 1945). Where many offspring are born at a time to a mammalian female she must offer a number of mammary glands at least equal to the number of offspring. When only one is produced one mammary gland is required (but the rule of symmetry operates to yield a pair). In those mammalian forms which are monotocous there is a direct relation between the anatomy, habitat, and habits of the species and the particular pair of mammary glands that is retained.

The human female is characteristically monotocous and her anatomy is in accord with her reproductive habits. She extrudes as a rule only one ovum at each ovulation during the period puberty-menopause. Exceptionally she reveals her phylogenetic relationship by shedding more than one ovum (polyovular multiples) or, like the armadillo, produces an ovum which after fertilization divides to give rise to several embryos (monovular multiples). Fertilization is internal and conception certain if intercourse occurs shortly before or after ovulation (and there are no pathological barriers). Her uterus is non-cornuate, suitable for the accommodation of a singleton. She has but one pair of mammary glands, but, unlike the marsupial which often produces young in numbers greater than the number of her teats so that some must necessarily die, the human female can attach the surplus to a bottle. The human young is so immature at birth

and demands so long a period of time to achieve self-sufficiency (and for initiation into society) that in man parental care reaches its highest degree of expression. So it is that in man the family grouping reaches its maximum development and in a human society social agencies share, reinforce, and extend parental responsibilities by means of crèches, nurseries, schools, universities and the like, and by the provision of foster parents: nurses, teachers, policemen, and others. By these and similar means any conflict between individuation and genesis can be resolved and the reproductive habits of our species are no longer necessarily limited by the circumstances of our external world, since these latter can be changed by man.

Parental care reinforced by communal care does much to reduce mortality among the young. The application of science by means of sanitary laws and habits, raised standards of living and of education, advances in medical knowledge, have played their parts in reducing infant and child mortality and in extending life expectancy. Since such reduction has outpaced the fall in the birthrate it is eminently possible for a population such as our own to maintain or even enlarge its total size with comparative ease if it so desires. Monotocia suffices.

The Hazards of Polytocia as Limiting Factors

It would seem to be generally agreed that not more than 20 to 50 per cent. of all the twins that are conceived are alive at the end of the period of pregnancy. Twins are commonly reduced by foetal death to a singleton, triplets to twins or a singleton. The observed facts concerning stillbirth, infant mortality, and maternal mortality in relation to multiple births support the view that the human female is not equipped for the production of more than one young at a time.

Stillbirth is several times as common among twins as among singletons. Munnell and Taylor (1946) found that the gross foetal mortality (28·1 per cent.) among multiples was four times greater than the gross foetal mortality rate (7·0 per cent.) for all deliveries, and that the corrected foetal mortality for twins (9·1 per cent.) was almost twice as great as the ten-years' average for all deliveries (5·5 per cent.). According to Hirst (1940) stillbirths are five times as common among multiples as among singletons. Burns' (1942) figures show that it was two to three times as common. The figures for Scotland for 1945 were 68 per 1,000 for twins and 33 per 1,000 for singletons.

Authorities are agreed that dystocia and birth injury are far more common among multiples for the reason that their mutual interference during parturition tends to lead to faulty presentation. As a result of birth injury mental defect has a higher incidence among multiples than among singletons.

Prematurity is commoner among twins than among singletons and is universal among triplets and higher. Kerr and others (1944) state that premature labour occurs in about 70 per cent. of all cases of multiple births. It is the outstanding cause of the greatly increased mortality among them. Baird (1945) records that multiple pregnancy was associated with 12·2 per cent. of premature births, whilst Crosse (1945) puts the figure as high as 16·6.

Neonatal death is twice as common among multiples as among singletons, as would be expected since so many of the causes of stillbirth continue to operate during the neonatal period. The toxaemias of pregnancy, polyhydramnios, uterine inertia, prolapse of the cord, and post-partum haemorrhage are all much more frequently encountered in multiple pregnancy (see Munnell and Taylor, 1946). Hirst (1940) states that neonatal deaths are five times as frequent among multiples as among singletons. Burns (1942) found that the neonatal rate for multiples was about six times that for the whole group, including both multiples and singletons, studied. The postnatal rate for multiples in Burns' (1942) survey was twice that of the total population at risk.

Maternal mortality is higher in multiple pregnancy. Hirst (1940) found it to be, as also did Burns (1942), twice that of singleton pregnancies on account of the greater incidence of haemorrhage and toxaemias.

So far medicine has not gained the power to overcome these hazards of polytocia.

The Rate of Reproduction as a Limiting Factor

After the first pregnancy the rate of reproduction would seem to have a direct influence upon maternal and infant mortality and stillbirth. The advocacy of "spacing" on the part of family planning clinics would seem to be more than justified. The state of health of the mother influences in a general way the state of health of the unborn child. Childbearing, and especially long-continued lactation, is a strain from the effects of which the mother recovers, though perhaps never completely in a great number of instances, in time. Exposure to the same strain before recovery increases the hazards of pregnancy for both mother and infant. Such mothers commonly produce weakly babies among whom the neonatal death rate is high (Burns, 1942). Birth intervals of less than two years predispose to prematurity (Joint Committee, 1948).

The Hazards of Parity as Limiting Factors

Stillbirth, infant mortality, and maternal mortality are all related to parity. It would seem that either the strain of reproduction is cumulative or else the reproductive efficiency of the human female deteriorates with an astonishing rapidity. It is to be stressed, however, that it is not always a simple matter to disentangle the effects of maternal age and of socio-economic circumstance from those of parity itself.

The probability of a stillbirth is least in the case of a second pregnancy and thereafter rises with increasing parity. The probability of a stillbirth in the case of a first child is greater than in the case of a fourth but less than in the case of a fifth. The stillbirth rate is higher at all ages of the mother for primiparae than for multiparae of the same age, the rates for both increasing after the age of 25 (Sutherland, 1946), and of the two factors, parity and maternal age, the former would appear to be the more important.

Prematurity is least among mothers aged 25 to 35. First babies are more often premature (8·0 per cent.) than those resulting from subsequent births (5·3 per cent.). For all birth orders premature births are more frequent among the poor, the cause for this being multiple: maternal age, parity, inadequacy of antenatal care, nutrition (Joint Committee, 1948).

Neonatal mortality, like stillbirth, decreases with increasing parity up to a point for the reason that first births carry an extra risk. But Burns (1942) found that among seventh and later children neonatal deaths (including stillbirths) were greater than the total deaths (including stillbirths) up to the age of five in the case of the first, second, and third children, and presents the view that this early death among later sibs would not be seriously affected by any system of family allowances or such like.

Postnatal mortality cannot so easily be related directly to parity. It increases with family size for the reason that large families involve an extra risk of infection of the most recent addition by its older sibs. In this country, too, there is a direct relation between family size and the socio-economic circumstances of the home: larger families are found for the most part among the poorer strata in which the women seem incapable of planning their lives (*Lancet*, 1945). Thus it is that large family size is so commonly associated with low income, thriftlessness, poor educational standards, low standards of living, insanitation in the home, and avoidance on the part of the mother of the clinics which offer help in the matter of contraception and maternal and child welfare. No wonder, then, that Yudkin (1944) found that children from small families were bigger and heavier and had a higher haemoglobin level than children from large families and that these differences were greater in the case of children from the poorer areas, or that Burns (1942) found in her classical survey of infant and child mortality in Durham that families with the lowest death rate were the one-child families, and that the late children of large families had a high death rate at all stages. Bearing on this question also are the observations and tentative conclusions of Fraser Roberts (1939), Burt (1946), Thomson (1947), and Himmelweit (1948), which suggest that there is a negative correlation between intelligence and size of family. These most important and disturbing conclusions have been subjected to criticism by Woolf (1947) and await final proof.

There is a gradual increase in maternal mortality with increasing age of mother, the rate becoming sharply accelerated after the age 30 to 34. Furthermore, when marriage or the first pregnancy is postponed to an age around 30 then, as Burns (1942) has shown, not only is the first birth relatively dangerous but all subsequent births are associated with a maternal death rate which is relatively high for that stage of the family. This in part explains the lack of improvement in maternal mortality in the better-off classes who, on the whole, marry late. It is exceedingly difficult to separate the effects of maternal age and parity. It can safely be said, however, that if all families consisted of three or four children born to mothers under 30 the maternal mortality rate would be halved. Primiparae have a higher death rate than 2-, 3- and 4-parae. Mortality is lowest in 2-parae and is under average in 1-, 3-, and 4-parae. In more than 4-parae it is in excess, this excess increasing steadily with each additional pregnancy (see Report of Scottish Departmental Committee, 1944).

Although the production of large families is associated with a high maternal mortality the decrease in the average size of family has not been attended by a corresponding fall in the maternal mortality rate, for the reason that a decrease in average family size means an increase in the proportion of first births, these being associated with increased hazards, and that first births now occur more frequently at older maternal ages than used to be the case so that greater risks must be encountered. Moreover, when the first birth is postponed all subsequent births must occur at ages which are associated with maternal risks relatively high for the birth rank of the child.

It is exceedingly difficult, if not impossible, to advocate early marriage and early childbearing on purely biological grounds. Now that life expectancy

has become so greatly extended it is but reasonable to spend more time in apprenticeship. This is the real argument in favour of the raising of the school leaving age. If the average woman at birth can expect to live to 60 she can afford to spend her first 25 years in equipping herself with the skills and the arts of living. Marriage is a social institution and those who engage in this contract can reasonably be expected to be socially as well as biologically mature.

There can be no doubt that if the present social gradient in respect of stillbirth, infant mortality, and maternal mortality could be obliterated by adequate social action these rates would greatly fall. At the present time the poorer among us tend to marry and reproduce earlier than do the relatively well-to-do. There is thus an association of early reproduction and poor environmental circumstances on the one hand and later reproduction and good environmental circumstances on the other. The present distinction between the socio-economic classes in respect of infant and maternal mortality suggests that in so far as these hazards are concerned environmental circumstance is more important than parity and maternal age (within limits). But even though the obliteration of this gradient would undoubtedly yield an equalization, and the stillbirth rate and the infant and maternal mortality rates generally would then be those which now are characteristic of Class I of the Registrar-General, it is quite certain that the effects of parity and of maternal age would still be easily discernible.

Two notions emerge from a consideration of these observations. The first is that since the first pregnancy is so much more hazardous than the second (the least hazardous of all) for both mother and child it would seem that in the human subject, as in the laboratory animal (see Asdell, Bogart, and Sperling, 1941), pregnancy has a maturing effect which yields a greater efficiency in reproduction. If this is so, then investigation should be planned to discover a method whereby the O-para could be prepared for pregnancy (endocrinological or nutritional priming, application of physical medicine ?) so that the first pregnancy could, as it were, become the second. If this were possible much life could be saved. Another matter that deserves investigation is that of reducing to a minimum the drain of lactation upon the mother and at the same time safeguarding the interests of her infant. Maternal age is, of course, a complicating factor. The potential reproductive efficiency of the human female is at its peak in the woman under 25, appearing to begin to decline after the age of 20 or so. The observation of Matthews Duncan (1866) that the initial fecundity of women gradually waxes to a climax, probably about the age of 25, and then gradually wanes still commands the support of the great majority of obstetricians and is in line with the evidence derived from animal experimentation. It follows, therefore, that what is required is the maintenance of youthfulness of the individual as a whole and the maturation of her reproductive system.

The second notion, due allowance having been made for the effects of maternal age and unpropitious environmental circumstance, is that the human female is not built for the efficient production of more than four children in all, or, as Kerr and others remark (1944): "These facts might very naturally be advanced as an argument in favour of limitation of conception after the fourth or fifth pregnancy." In connexion with this second notion it is of peculiar interest to find that there is a very widespread lay opinion that the optimum family size is three to four. The British Institute of Public Opinion recently issued the figures given in the table (*News Chronicle*, May 30, 1948), whilst Baird

TABLE

BRITISH INSTITUTE OF PUBLIC OPINION SURVEY OF PREFERENCES IN FAMILY SIZE
(From the *News Chronicle*, May 30, 1948)

Number of children thought best	Great Britain %	France %	Canada %	Australia %	Holland %
1	4	5	1	1	1
2	39	31	21	14	22
3	27	38	22	21	29
4	20	17	28	46	24
4+	4	5	26	16	22
No opinion	6	4	2	2	2
	100	100	100	100	100

(1946) found on enquiry that most of the poorer mothers with ten children, as also most of the well-to-do with one or two, admitted that they would have been happier with three or four. These expressions of opinion can surely be accepted as being representative of the peoples of present-day communities with a social structure and philosophy more or less similar to our own and with adherents to the different churches present in the population in the same kind of proportions. They are supported by the observations of Titmuss and Grundy (1946) to the effect that in Luton there had occurred during a period of three generations a large increase in the proportion of one- and two-child families and a dramatic fall in the proportion of families of five or more.

The Bearing of these Observations and Suggestions upon Population Policy

The industrial revolution can rightly be blamed for much human misery and for much misdirection in our development as a society. Nevertheless, it is to this industrialization and urbanization and to the reactions of human beings to the circumstances so created that indirectly a significant reduction in family size must be ascribed. Economy in children made it possible for families to survive and to share in the abundant material wealth that was then created and thus in the rising standards of living. It is to be noted that this reduction in family size was not followed by a reduction in population size. In fact the population increased at an unprecedented rate, for the reason that though fewer children were being produced far fewer died than was formerly the case. In this decline in mortality the reduction in the average size of the family was by no means the least important factor, for between the size of the family and the chances of survival on the part of the members thereof there was and still is a direct relationship. It is established that large average family size is not a prerequisite for population maintenance or increase.

In a recent P.E.P. publication (1948) it is stated that " the objective to be achieved (by a population policy) is stable fertility at a level involving an average number of about 2·5 children in each family, and this average will mean a considerable number of families of four or five children." This statement, which will command the support of almost everybody and every organization that is concerned with the maintenance of our population size, is in remarkable accord with the facts and opinions presented above. If it is true that there is a strong biological urge toward parenthood in most individuals, then this urge in the great majority of instances is satisfied with a family of two, three, or four. The individuals in the opinion survey cited were relating family size to their own circumstances and were not interested in demographic considerations. Yet their opinions concerning the optimum size of their own families coincide exactly with the conclusions reached by scientists in their calculations concerning population growth and with the observed facts relating to the connexion between mortality and family size. Manifestly if the average family size is to be 2·5 and the maximum 4, then in the absence of families of 4+ there will have to be far more families of 3 and 4. How many more it is difficult to determine using such figures concerning family size as are available, but if the Scottish figures are taken and if the present distribution of family size in the population is accepted as the basis for argument and if illegitimacy is disregarded, then it would appear that certainly not less than about 50 per cent. of the parents with no, one, two, and three children would be required to produce an additional child. The ideal policy would seem to be the encouragement of the majority of parents to produce a family of three whilst the mother is still young, and in the case of the families of proven biological worthiness, as estimated by the low incidence of stillbirth, infant and maternal mortality and morbidity, to encourage the production of additional offspring. Should this ever become the objective, then the impaired fertility of the childless and small family couples desiring children or more children would become a problem of even greater importance. (In the rat (see Asdell and others) the productive ability of the female throughout life is indicated by her initial performance. This is probably true also in the case of the human female, but the yardsticks by which performance is measured must be different.)

Summary

1. The phenomena of childlessness and small family size are common and are important limiting factors. The part played by psychological factors in the causation of low fecundity is considered.

2. Lethal and sub-lethal genes play their part, a by no means unimportant one.

3. It is argued that the human female is characteristically monotocous and shown that polytocia greatly augments the hazards of childbearing and that monotocia suffices for the maintenance or increase of population size.

4. It is shown that the rate of reproduction, parity, and maternal age all operate to limit family

size—a rapid rate, increasing parity, and increasing age all being attended by increasing infant and maternal mortality.

5. Since the first pregnancy is peculiarly hazardous and the second the least so, it is suggested that investigations should be undertaken to discover the means whereby the first could be ridded of its dangers; could be, as it were, transformed into the second.

6. Evidence is displayed which points to the conclusion that the maximum family size should be four for the majority of married couples.

7. The evidence derived from opinion surveys shows that the " best " size of family is three to four.

8. Demographers are agreed that for the maintenance of our population size the average size of a family should be 2·5, which means that many must produce three, four, and five.

9. All things considered it would seem that the majority of married couples should be encouraged to produce three children whilst the mother is still young, and that those who together with their early offspring display an extraordinary healthiness should be encouraged to produce additional children. If families of more than four are not to be encouraged then it would appear that not less than 50 per cent. of parents with one, two, or three children would have to produce an additional child if the total population size is to be maintained.

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STUDIES OF THE DIET OF STUDENTS AT EDINBURGH UNIVERSITY

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INDEX

Introduction
Scope
Technique
Results
Average daily consumption of nutrients
Consumption of individual foodstuffs
Pattern of food habits
Discussion and conclusions

INTRODUCTION

Sir John Boyd Orr (1937) demonstrated that in the social and economic conditions prevailing in Great Britain during the nineteen-thirties one-tenth of the population was consuming food which was both insufficient in quantity and unsatisfactory in quality when compared with accepted dietary standards. This underfeeding was associated with much ill health and poor physical development. The outbreak of the 1939-45 war stimulated the Government into a large number of measures designed to control the distribution of food equitably and thereby to raise the level of health and the martial efficiency of the people. In this the Government appeared to achieve a great success, and the consensus of public opinion was that the limited food resources available throughout the period of the war were shared out equitably in relation to human needs. Further, the majority of expert opinion agreed that not only had the general health of the people not deteriorated as a result of the food restrictions, but in certain respects, notably as regards infant and maternal health, an improvement had taken place. Rationing, with its inconveniences and irksome restrictions, was accepted as inevitable while hostilities lasted. Many persons had, however, fostered the false hope that, with the cessation of fighting in 1945, food restrictions, too, would soon cease. But few people had realized the precarious position of international agriculture, even before the outbreak of hostilities, and the serious blows it received during the war. The damage to world trading also precluded any possibilities of an immediate, plenteous supply of food capable of meeting all demands. Indeed, in 1946-47 and in early 1948 the food situation in this country deteriorated. A "dollar crisis" in the autumn of 1947 and a partial failure of our potato crop combined to make that winter perhaps the worst from a food point of view since 1939. It has now indeed become clear to almost all of us that food shortages are likely to persist for a long period and that restrictions are a feature of peace as well as of war.

Now, rationing is no longer a military emergency measure and a complex governmental food-controlling machine has become a recognized part of peacetime economy. It is therefore important to devise means to study the machinery and its effect on food consumption and food habits. Experiences of other countries have shown that a rationing scheme may be one thing on paper and a very different affair in practice. The present survey was undertaken to find out how a group of people were in fact faring during the winter 1947-48. University undergraduates enjoyed no special privileges as regards food. All the special rations for schoolchildren cease at the eighteenth birthday, before most of the students have entered the University and also before many of the men have completed their growth and reached full stature. Further, university students who live at home or in lodgings do not receive the benefits of the numerous industrial canteens available throughout the country to so many young people. The study, then, is of a group of people with no special privileged source of food supply.

SCOPE OF THE SURVEY

In all, 298 students took part in the survey and had their food consumption recorded. Only those students under 21 years were selected. With one or two exceptions none of them had undertaken

military service. Thus the special problems presented by the large numbers of ex-service students were deliberately avoided and the sample selected as representative of young persons coming to the University straight from school. Table I shows the numbers of each and of their residence during term.

TABLE I

NUMBER OF STUDENTS SURVEYED

		Men	Women	Total
Living:	at home ..	61	71	132
	in lodgings ..	47	74	121
	in University hostels ..	19	26	45
	Total ..	127	171	298

Of this total, 145 were from the Arts faculty, 113 from Medicine, and 40 from Science. The Law and Divinity faculties contain only graduates proceeding to secondary degrees, so they were not included. No essential difference was found between the diets of the students in the different faculties, and no analyses on this basis have been recorded.

For the survey of students living at home or in lodgings, names were selected at random from matriculation rolls in the faculties of Arts and Medicine, and each selected individual was written to and asked to co-operate. Out of 126 selected medical students, 98 (78 per cent.) accepted and completed the survey. In Arts, 250 students were written to and 127 (51 per cent.) completed the survey. The numbers of those willing to take part in the survey were actually higher than these figures indicate. Unavoidable absenteeism prevented several students from co-operating. The 28 science students were all volunteers. The number of students in this faculty below the age of 21 was too small to allow any selection. The hostels chosen for this investigation were the two largest hostels for men and women respectively attached to the University. In the men's hostel there were 100 students studying in all faculties of the University. On account of war service, many were older than usual, but 25 were below 21 years of age and of these, 19 completed the survey satisfactorily. The women students were chosen from a group of five hostels with common catering arrangements on the outskirts of Edinburgh, each with some 60 students. From these the names of 30 girls below 21 years were selected at random. These girls were asked to participate, and 26 concluded the survey.

The recordings took place at the end of the autumn and the beginning of the spring term, and covered the months of December, January, and February only. Each student was under continuous observation for eight consecutive days during this period.

TECHNIQUE

Many observers have produced reliable methods for the measurement of the food consumption of a whole family in the home. Weighing of all available food in the kitchen is the basis of these methods. Details of technique vary according to the socio-economic level of the home, but accurate records of family food consumption in the home have been made in many countries throughout the world and in widely different social classes. Family surveys, based on observations in the kitchen, fail to record accurately the food derived from restaurants and canteens—a large and increasing proportion of the total food consumption in Great Britain today. Such surveys also can give no account of the distribution of the food within the family. To get accurate information on these points, nutrition workers have been developing methods of individual survey.

The accurate recording of the daily food intake of an individual is an exceedingly difficult task. The pioneers in this work were the classical experimental physiologists of the end of the nineteenth and beginning of the twentieth century. For the metabolic measurements which they were making, precise records of food consumption were required, and for the most part "professional" subjects were used for the experiments. The difficulties of obtaining accurate dietary records are numerous and put a great strain on the honesty and good faith of the subject. Benedict (1919), a most experienced observer, preferred to choose the students of a religious foundation as his experimental subjects. Yet he asked them to promise in writing faithfully to weigh all they ate and took great pains in addition to obtain confessions of any items which they accidentally failed to record.

More recently, individual diet surveys have been made of larger groups in which each individual has been asked to weigh and measure every article of food immediately before consumption. Widdowson has been a pioneer in the use of this technique and records surveys of 63 middle-class men (Widdowson, and McCance, 1936), of 63 women, again nearly all from the middle class (Widdowson, 1936), and of 1,028 children (Widdowson, 1947). These and similar surveys have provided much valuable basic physiological knowledge. For sociologists and food

administrators the technique has two limitations. First, only subjects who are willing, co-operative, and intelligent can be surveyed. Secondly, it is impossible to assess the changes in normal food habits and customs that may be brought about by the necessity of weighing all food before eating. The individual weighed survey may indeed give an accurate record of food consumption during the period of the survey, but this is not necessarily an accurate record of normal food consumption.

In an attempt to make the method more generally applicable with a minimum of loss of accuracy, some observers, notably Youmans and others (1942) and Bransby and Wagner (1945) have used ordinary domestic measures, such as cupfuls, spoonfuls, etc., instead of balances. Cups and spoons of a uniform size are provided, and sometimes models of foods with which the actual amounts eaten are compared. Bransby and others (1948) have shown that under certain circumstances these "homely measures" can be substituted for balances without any substantial loss of accuracy.

Some information about the nature and adequacy of a diet can be obtained by the collection of a simple diet history. This is essentially the method of practical clinical medicine. History-taking is a difficult art and suffers from the drawback that all data obtained are subjective in origin. Yet such data, if lacking the special precision of chemical measurements, may yet serve as useful guides to human behaviour. The "questionnaire" type of survey has the outstanding advantage that it involves a minimum of interference with the normal life of the subject. It can be used much more widely amongst the people than the weighed individual survey and, further, it is less likely to alter the usual dietary pattern. We have used this questionnaire method as being the only method, in our opinion, available for a survey of the extent we wanted. We have, however, added a number of safeguards in an attempt to get the recording as accurate as possible. The method which we employed was as follows.

After the subjects had been selected and had agreed to co-operate, each was interviewed. At the interview the object of the survey was explained and each person was given a log-book in which he was asked to record in spoonfuls, cupfuls, number of slices, etc., the quantities of every item of food eaten. It was stressed that records should be made as soon as possible after each meal. An appointment was made for the following day. At this, a dietitian went over the log-book and assessed the exact quantity of each article of food. In order to help in determining the weight of each item, a selection of nearly two hundred portions of common foods ready for consumption was displayed on a table. For example slices of bread of varying thicknesses and from loaves of different shapes, different types of sausages, thick and thin portions of cooked meats, fish, etc., various kinds of both cooked and uncooked vegetables, samples of the fresh fruits available at the time, stewed fruits, and a wide variety of cakes, buns, scones and biscuits, portions of butter, jams, etc., were all included in this display. The foods were displayed as for serving and the actual weight of each sample, when first prepared, was recorded. Formalin was used to preserve some of the meats, but many samples had to be replaced frequently to avoid shrinkage and desiccation. Every attempt was made to include all items in this display and if a student had consumed something not on display, it was obtained for the following day. A number of subjects brought from home duplicate samples of less familiar foods, if he or she found the quantity difficult to describe to the dietitian. In addition four different portions of each type of food served in the men's and women's Unions, where many of the students had their mid-day meals, were weighed. Buns, cakes, etc., as served at the snack counters, were weighed, and similarly cakes and buns from the popular restaurant in the vicinity of the University.

The students recorded their food consumption for eight consecutive days. The first day's record was considered as a trial and discarded. An attempt was made to fix interviews with the dietitians every day during the week except Sunday. This was not always possible, but each student had at least five interviews and many had more. All the dietitians employed had had considerable experience of survey work, and this was very valuable in enabling them to assist the students clearly to identify the foods they recorded in their log-books and to make quantitative comparisons with the weighed foods.

Finally, the great majority of the students had an interview with the whole investigating team three or four months after the recording had finished. At this interview the records had been added up and analysed and the results shown to each student. It was possible to discuss any apparent anomalies and to discard a few surveys (less than 2 per cent.) in which the recording had been obviously incomplete, or in which, owing to illness or other circumstances, the diet for the week had clearly been different from the usual pattern. At this interview much information was obtained about the student's personal attitude to food, his or her likes and dislikes, and how each reacted to food restrictions and rationing.

It is extremely difficult to assess the accuracy of

the questionnaire method. The only check that we have been able to carry out has been a small comparison with the weighing technique. Students who were living at home and seldom ate out were asked if they were willing to repeat the recording for a further seven days in exactly the same fashion, but on the second occasion actually weighing and recording each item of food before consumption.

Only eight volunteered to undertake a weighed survey and this, in itself, is an example of the difficulties and limitations of the weighing technique. Table II shows the average daily nutrient intake of these eight subjects according to the two methods of assay.

TABLE II

AVERAGE DAILY INTAKE OF CALORIES AND NUTRIENTS FOUND IN EIGHT SUBJECTS BY TWO DIFFERENT SURVEY METHODS DURING TWO CONSECUTIVE PERIODS OF SEVEN DAYS

	Weighing	Questionnaire
Calories	2,660	2,710
Protein (g.)	90	94
Fat (g.)	94	105
Calcium (g.)	1·0	1·0
Iron (mg.)	18	19
Vitamin A (I.U.) ..	4,500	4,300
Vitamin C (mg.) ..	72	65

The check, as far as it goes, confirms Bransby and others (1948) in the general conclusion that the weighing and questioning method can give approximately the same average values for energy and nutrients under certain conditions. While this may be so for average values, greater variations occur in individual diets.

Individual differences in the average daily calorie consumption were all under three hundred calories. Boulton (1945), quoted by Widdowson (1947), found similar variations when she studied the average daily consumption over a period of four consecutive weeks using the weighing method all the time. It would, of course, have been ideal to have had both methods in operation during the same week but the method could not be checked by asking the subject to weigh his food and later during the same day describe it at an interview. It is, too, of interest to note that in spite of the fact that each subject had gained some experience in recording during the first week, we still found, on all books except one, one or two items insufficiently recorded. Where the weighing technique is being carried out by the subject without any personal contact with the investigator it seems highly probable that a number of adjustments will be necessary before the calculation of the diet in terms of calories, etc., can be carried out.

It is clear, on both theoretical and practical grounds, that it is impossible to check accurately any method for carrying out individual diet surveys. A diet survey is a complicated sociological process in which conditions cannot be controlled and repeated as in a chemistry laboratory. The final test of the value of any survey method is the practical value of the conclusions that can be drawn from it.

RESULTS

AVERAGE DAILY CONSUMPTION OF NUTRIENTS.—Even a small diet survey means the collection of a vast amount of data. The selection of the best method of presentation of the data involves difficulties. The most usual method is to convert the quantities of foodstuffs consumed into calories and nutrients. Daily consumption of each of these is determined and recorded, sometimes with a range of extreme values and with a calculation of the standard deviation of the values. We have followed this practice, and Table III records average daily consumption of calories and nutrients. Such a table provides a convenient method for summarizing the results of a survey in chemical terms. The preparation, however, necessitating the use of a detailed table of food analyses involves a considerable additional source of error. Our results have been calculated from tables in use at the Ministry of Food, which, with certain modifications, are based on *The Nutritive Value of Wartime Foods* (Accessory Food Factors Committee, 1945) and *The Chemical Composition of Foods* (McCance and Widdowson, 1946).

For made-up dishes, it is inevitable that there must be considerable variations in the recipes used for their preparation, each differing from the samples analysed for the preparation of the tables. Where the ingredients of an individual dish were known, the analyses were based on this information. Bransby and others (1947) have shown that assessments of diets using standard food analysis tables may differ in important respects from an assessment of the same diets obtained by chemical analysis of aliquot samples of food consumed.

Age, height, and weights are recorded in Table IIIA, and the American National Research Council Recommendations for dietary allowances (as revised in 1948) in Table IIIB. It is difficult to know with which N.R.C. class Edinburgh students may be best compared, for the average ages of all our groups was 19 and so they were not strictly comparable with the 16-20 group. Average weights for our men

TABLE III

NUTRITIVE VALUE OF DIETARY INTAKE OF VARIOUS GROUPS

		Men			Women		
		At home	In lodgings	Hostels	At home	In lodgings	Hostels
Calories	M	3,040±580	2,900±470	2,960±290	2,180±370	2,280±400	2,330±310
	R	2,140 - 4,690	2,150 - 3,870	2,440 - 3,590	1,450 - 3,160	1,520 - 3,220	1,750 - 3,080
Total protein (g.)	M	101±19	102±15	97±11	76±13	78±13	79±12
	R	74 - 163	77 - 137	81 - 109	51 - 118	49 - 102	56 - 99
Animal protein (g.)	M	45±11	47±9	39±7	39±10	38±8	38±8
	R	30 - 77	30 - 62	25 - 58	20 - 76	20 - 61	21 - 51
Fat (g.)	M	106±23	101±20	92±15	81±16	83±15	89±15
	R	64 - 185	67 - 153	70 - 122	52 - 111	51 - 116	71 - 142
Calcium (g.)	M	1·2±0·3	1·1±0·2	1·2±0·2	0·9±0·2	0·9±0·2	0·8±0·1
	R	0·7 - 1·7	0·6 - 1·7	0·9 - 1·7	0·4 - 1·3	0·5 - 1·3	0·5 - 1·0
Iron (mg.)	M	20±4	21±3	22±3	15±3	16±3	18±3
	R	12 - 34	15 - 28	17 - 26	10 - 26	9 - 24	12 - 23
Vitamin A (I.U.)	M	4,800±2,300	4,800±2,100	6,700±1,800	3,400±1,800	4,300±1,900	5,800±2,400
	R	1,600 - 11,300	1,000 - 9,800	4,900 - 12,300	1,000 - 10,300	1,100 - 11,500	2,500 - 10,900
Vitamin B_1 (mg.)	M	1·7±0·4	1·7±0·3	1·7±0·2	1·2±0·2	1·2±0·3	1·2±0·2
	R	1·1 - 2·7	1·0 - 2·2	1·4 - 2·2	0·7 - 2·0	0·7 - 2·2	0·9 - 1·5
Riboflavin (mg.)	M	1·7±0·4	1·6±0·3	1·8±0·3	1·3±0·3	1·3±0·2	1·4±0·3
	R	1·1 - 2·7	1·1 - 2·2	1·4 - 2·3	0·8 - 2·2	0·7 - 2·1	0·7 - 1·9
Niacin (mg.)	M	14±3	14±3	17±5	10±2	11±3	11±2
	R	10 - 22	8 - 23	12 - 31	6 - 16	6 - 14	7 - 14
Vitamin C (mg.)	M	75±45	55±26	60±15	60±30	60±30	50±10
	R	20 - 160	20 - 120	40 - 100	15 - 125	20 - 120	40 - 85

M—Mean. ±—Standard deviation. R—Range of extreme values.

TABLE IIIA

AGE, HEIGHT, AND WEIGHT OF SUBJECTS

No. in Group		61	47	19	71	74	26
Age (months)	M	229±10	231±10	240±10	233±10	234±10	242±5
	R	205 - 247	210 - 254	216 - 250	213 - 250	206 - 255	230 - 251
Height (inches)	M	69·5±2·1	68·5±2·1	71·2±1·8	64·5±2·2	64·5±2·2	65·0±1·9
	R	65·0 - 73·0	64·5 - 73·5	66·0 - 74·0	60·0 - 69·5	58·5 - 68·5	61·0 - 69·5
Weight (pounds)	M	146±12	146±15	155±15	131±15	128±16	133±13
	R	114 - 176	125 - 185	133 - 193	102 - 171	94 - 176	111 - 161

M—Mean. ±—Standard deviation. R—Range of extreme values.

TABLE IIIB

RECOMMENDED DAILY DIETARY ALLOWANCES, FOOD AND NUTRITION BOARD, NATIONAL RESEARCH COUNCIL

	Calories	Protein (g.)	Calcium (g.)	Iron (mg.)	Vitamin A (I.U.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)	Ascorbic acid (mg.)
Man—156 lb.									
Sedentary	2,400	70	1·0	12	5,000	1·2	1·8	12	75
Physically active	3,000	70	1·0	12	5,000	1·5	1·8	15	75
Boy 16-20 years (141 lb.) ..	3,800	100	1·4	15	6,000	1·7	2·5	17	100
Woman—125 lb.									
Sedentary	2,000	60	1·0	12	5,000	1·0	1·5	10	70
Moderately active ..	2,400	60	1·0	12	5,000	1·2	1·5	12	70
Girl 16-20 years (119 lb.) ..	2,400	75	1·0	15	5,000	1·2	1·8	12	80

were almost identical with the N.R.C. figure for an adult man, and for women our average weights were all higher than the N.R.C. figure for an adult woman.

Calories.—The average consumption of calories by all three groups of men was the same and almost identical with the N.R.C. recommendations for "Physically Active Man". For women, the average for all three groups fell between the N.R.C. figures for "Sedentary" and "Moderately Active Woman". These figures are consistent with the fact that our students could be described as "sedentary" for five days of the week, though many took vigorous athletic and other exercise at the week-ends. None of the students complained of an inability to obtain a sufficiency of energy-yielding foods. The figures probably reflect accurately the physiological requirements.

Protein.—The average total protein of all groups of both men and women were well above the N.R.C. recommendations for adults, and indeed in all cases, almost exactly on the higher levels recommended for adolescents. A very few individual women had low recorded intakes, but the study indicates that total protein consumption was satisfactory.

Animal Protein and Fat.—The N.R.C. gives no recommendations for these nutrients. In all groups of men and women, average consumption of animal protein was over 40 per cent. of the total protein intake, and the average consumption of fat provided over 30 per cent. of the total dietary calorie value. The fat consumption in the men's hostel was just below this figure, but this exception cannot alter the conclusion that, in respect of animal protein and fat, all groups had sufficient for physiological needs.

Calcium.—All three groups of men had average calcium intakes, midway between the N.R.C. recommendations for adults and for adolescents, but all three groups of women were below both standards. The higher figure for the men is a reflection of a higher bread intake with the additional calcium therein. The N.R.C. recommendations are high, and undoubtedly provide a wide safety margin. There can, however, be little doubt that some students, especially the women, with recorded intakes of 0·4 and 0·5 g., were not taking what would be judged sufficient for satisfactory maintenance of bone.

Iron.—Consumption by men was adequate, and the averages for all groups of women satisfactory. However, individual women with recorded iron intakes of only 9 and 10 mg. were not obtaining a sufficiency. As will be described later, this is consistent with the presence of a mild anaemia in a small minority of the women.

Vitamin A.—During the survey week, the men's hostel had an extra supply of cheese, and the women's hostel an unusual supply of liver. These put up average vitamin A intakes in the hostels. Vitamin A activities of the diets varied widely and depended to a great extent on individual consumption of carrot. As vitamin A can be stored in large amounts in the liver, low intakes during one week may be partly compensated for by large intakes of vitamin-A-rich foods in another week. Thus the very low recorded intakes in one week of some students may not give a true overall picture. Only 5 per cent. of the students took cod-liver oil or other vitamin A preparations regularly. Vitamin A from these sources has not been incorporated in group averages.

Vitamin B_1.—The average consumption for all groups appeared to be adequate, the quantity present in the diet varying proportionately with the calorie consumption.

Riboflavin.—The average values obtained were slightly lower than the N.R.C. recommendations,

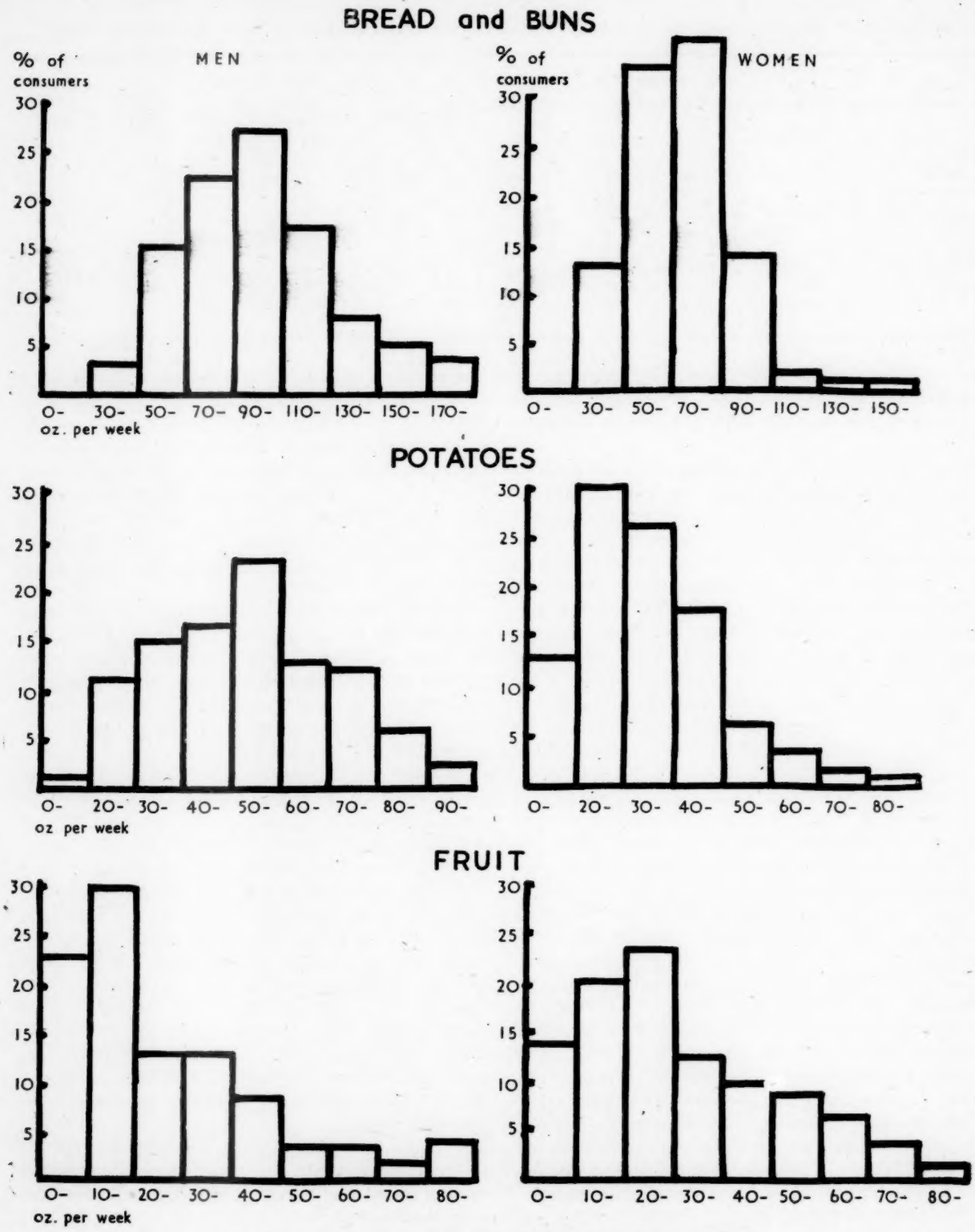

FIG. 1.—Consumption of bread and buns, potatoes, and fruit.

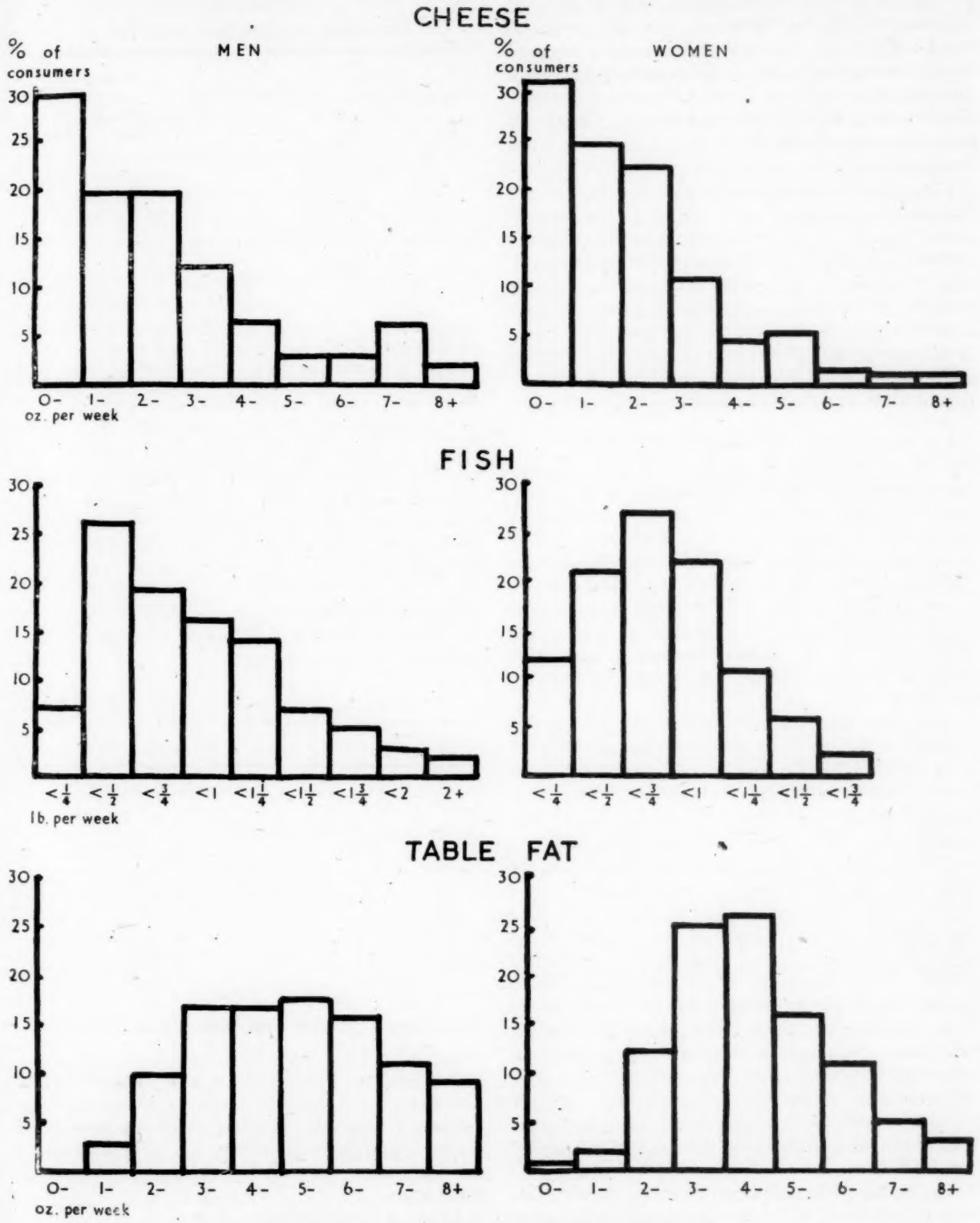

FIG. 2.—Consumption of cheese, fish, and table fats.

the hostel groups being higher because of the inclusion of liver and cheese.

Nicotinic Acid.—As for riboflavin, the average values were approximately that suggested, but again the range was very wide. Only five subjects supplemented their diet by the addition of vitamin B complex from proprietary brands of foods or from synthetic sources.

Vitamin C.—Average vitamin C intake for the groups was satisfactory, but individual consumption varied widely. The low figures recorded in many individual surveys are a measure of the low consumption of fruit and vegetables, discussed in the next section. The table of analyses used gave values for cooked vegetables, and no consideration of losses in storage on hot plates was made. Some losses undoubtedly arise in this manner, and the average figures given are therefore probably a little high.

CONSUMPTION OF INDIVIDUALS' FOODSTUFFS.—An alternative method of presentation is to record consumption of separate foodstuffs. In the tables which follow, this has been done. Instead of calculating a mean value for consumption and giving ranges, we have expressed the results as the number of persons under survey consuming a given quantity of food. In this way it is possible to show clearly the wide individual variations and also to relate these variations to the standard ration scales in force at the time, which were of necessity arbitrarily fixed.

The data which follow apply only to the 253 students living in lodgings or at home. The 44 students in hostels have not been included, since their diet was relatively standardized. The summary of the chemical analysis (Table III) shows that on the whole these hostel diets were satisfactory.

Cereals.—Table IV records the quantities of cereal in ounces per week consumed in the form of bread, cakes, buns, scones, etc. It does not include the relatively small amounts of cereal taken in the form of pudding, macaroni, porridge, or breakfast cereal. Wide differences in consumption occurred in both sexes, but none were found between those living at home and those in lodgings. No student said that he was unable to get enough bread; all said that they could eat as much of it as they desired. The official bread ration at the time for an adult was 63 oz. per week. There were clearly supplies to meet the demands of those who required more.

The eating of large quantities of cakes and buns is a characteristic of nearly all Edinburgh students. Most of the men and women took more than one-third of their total cereal as cakes or buns and often the proportion was over half. Women were found to eat slightly more buns than men.

TABLE IV

RECORDED CONSUMPTION OF CEREALS

Ounces of bread, cakes, and buns per week	Number of students	
	Men	Women
30-49	3	19
50-69	16	48
70-89	24	52
90-109	29	21
110-129	18	3
130-149	9	1
150-169	5	1
170+	4	0

The assessment of the amount of cereals consumed as puddings is difficult, as recipes vary greatly. The puddings most commonly taken were steamed puddings, tarts of various kinds, custard and semolina, though many more were met with occasionally. In about two-thirds of the diets of both men and women the weekly intake lay between 10 and 30 oz. The number of times per week that puddings were consumed is shown in Table V. Again, no difference was found between those at home and those in lodgings.

TABLE V

CONSUMPTION OF PUDDINGS

Number of times per week	Number of students	
	Men	Women
0	0	5
1	10	3
2	11	7
3	16	22
4	28	51
5	26	29
6 and over	17	28

Porridge no longer plays a predominant role in the diet of the Scottish student. Although it is frequently taken at breakfast, only one man ate it regularly at other times of the day. Table VI shows the frequency with which porridge was taken at breakfast.

There is a marked sex difference here. Whereas the majority of men had porridge for breakfast most days of the week, most women never touched it.

TABLE VI

CONSUMPTION OF PORRIDGE

Number of times per week	Number of students	
	Men	Women
Never	27	84
Occasionally (1-3 times)	18	28
Frequently (4-7 times)	63	33

The shortage of milk is possibly one factor which discourages the eating of porridge.

Proprietary breakfast cereals are not important rivals to porridge in the traditional breakfast. Sixty per cent. of men and 60 per cent. of women did not consume any during the survey. Among those who did, the calories obtained from this source were few, as none ate more than 10 oz. in the week. Again shortage of milk and perhaps the high "points" value of these proprietary foods may have limited their consumption.

A small amount of oatmeal was consumed as oatcake. Twenty-five per cent. of both men and women took up to 10 oz. during the week, but for none of the students was this an important food.

Potatoes.—The recorded consumption is shown in Table VII.

TABLE VII

RECORDED CONSUMPTION OF POTATOES

Oz. consumed per week	Number of students	
	Men	Women
0-9	0	6
10-19	1	13
20-29	12	44
30-39	16	39
40-49	18	26
50-59	25	9
60-69	14	5
70-79	13	2
80 and over	9	1

No difference existed between those at home and those in lodgings, but it is clear that the men consumed much more than the women. At the time of the survey potatoes were rationed, the weekly allowance being 3 lb. This weight, of course, includes the peel, whereas the recorded consumption in Table VII does not. Fifty-six per cent. of men and 12 per cent. of women students recorded an intake of over 50 oz. in the week. Of these big potato-eaters, a few complained of the small size of helpings in restaurants and clubs, but none of any shortage at home or in lodgings. The extra potatoes were obtained in a variety of ways; some had supplies sent in from the country, others had access to private gardens or allotments; some depended on stores laid in before rationing started, and not a few stated that their greengrocers were meeting their needs in full. A large proportion of women, probably about 50 per cent., did not eat their full ration. No doubt much redistribution of rations occurred within families.

Vegetables.—The recorded consumption of vegetables (other than potatoes) is shown in Tables VIII and IX. Table VIII gives cooked weight of green vegetables—cabbages, brussels sprouts, cauliflowers, spinach, lettuces, etc. Table IX refers to other vegetables such as carrots, turnips, swedes, beetroots, parsnips, onions, leeks, peas, beans, etc.

TABLE VIII

RECORDED CONSUMPTION OF GREEN VEGETABLES

Oz. consumed per week	Number of students	
	Men	Women
0-5	73	91
6-10	25	34
Over 10	10	20

TABLE IX

RECORDED CONSUMPTION OF OTHER VEGETABLES

Oz. consumed per week	Number of students	
	Men	Women
0-10	52	79
11-20	47	47
21-30	7	18
Over 30	2	1

In neither case was any difference found between those living in lodgings and those at home.

These figures do not include the vegetables employed in making soups. Scotch broth is a traditional dish, consisting of a vegetable soup usually, but not always today, thickened with barley or other cereals. The weekly recorded consumption is given in Table X.

In those students taking less than a pint a week (about half the total number) this source of vegetables is negligible. In some of the others it may represent a very considerable intake.

TABLE X

RECORDED CONSUMPTION OF SCOTCH BROTH

Pints consumed per week	Number of students	
	Men	Women
Up to 1	45	78
1 to 2	41	50
2 to 3	13	15
3 and over	9	2

Fruit.—During the period of the survey there was an abundance of oranges and grapefruits in the shops of Edinburgh. Tomatoes could also be obtained without difficulty. Table XI shows that, whilst some students ate large amounts of fruit, others took no advantage of the plentiful supplies available. Considerable differences existed both between the sexes and between those at home and in lodgings. Women ate more fruit than men, and those at home more than those in lodgings.

TABLE XI

RECORDED CONSUMPTION OF FRESH FRUIT

Oz. consumed per week	Numbers of			
	Men at home	Men in lodgings	Women at home	Women in lodgings
0-10	9	16	8	12
11-20	14	18	12	17
21-30	9	5	19	15
31-40	11	3	8	10
41-50	8	1	6	8
Over 50	10	4	18	12

Meat and Flesh Foods.—During the period of the survey the domestic ration of fresh butcher's meat for an adult was a shilling's worth. The amount purchased varied according to the quality of meat chosen. Table XII gives recorded consumption of fresh meat, including any obtained in restaurants and canteens. A few of the very low intakes are due to the student's not consuming his ration within the period of the survey.

Poultry, game, liver, and kidney were available as an additional source of fresh meat. These foods were unrationed, but not readily available and expensive. About half the men and one-third of the women had small quantities (up to 8 oz.) of meat in this form during the week. Only eight men and three women had larger amounts.

An additional source of meat are the " made-up " meat dishes such as sausages, meat pies, rissoles, mince, haggis, etc. The meat in these is always diluted with a considerable proportion of flour or other component. Nevertheless, these foods do provide a considerable additional source of animal protein. Table XIII gives recorded consumption of " made-up " meats.

TABLE XII

RECORDED CONSUMPTION OF COOKED EDIBLE FRESH MEAT

Oz. consumed per week	Number of students	
	Men	Women
Less than 4	2	11
4 to 7	34	68
8 to 11	34	41
12 to 15	28	22
16 and over	10	3

TABLE XIII

RECORDED CONSUMPTION OF MADE-UP MEATS

Oz. consumed per week	Number of students	
	Men	Women
Less than ½	11	44
½ to 1	31	69
1 to 1½	39	25
1½ to 2	15	5
Over 2	12	2

The bacon ration throughout the survey was 2 oz. a head weekly. The great majority of students were probably eating this amount and no more. Actual figures obtained in the survey show variations which are probably due to the fact that people sometimes consume two weeks' ration of bacon in one week and none in the next. Very few (about 5 per cent.) do not like bacon, and a correspondingly small number manage to get hold of these rations.

Throughout the survey fish was unrationed and readily available. Almost all students took advantage of this. Table XIV gives consumption of fish. The commonest kinds of fish eaten were herring and haddock, kippers, especially at breakfast, and cod, often served in restaurants. Almost all the quantities recorded represent fresh fish, fish cakes and other made-up dishes occurring comparatively rarely. Fish consumption appeared to be the same in lodgings as at home.

TABLE XIV

RECORDED CONSUMPTION OF FISH

Lb. consumed per week	Number of students	
	Men	Women
Less than ¼	8	18
¼ to ½	28	30
½ to ¾	21	39
¾ to 1	17	31
1 to 1½	23	24
1½ to 2	9	3
Over 2	2	0

Dairy Produce—Milk, Cheese, and Eggs.—At midwinter, milk production is at its lowest and the normal adult ration of two pints per week is a small allowance for a tea-and-coffee-drinking population such as the students. The great bulk of the milk was consumed in these beverages and only small amounts were left over for porridge, breakfast cereals, and puddings, and normally none for drinking as milk. The assessments of amounts of milk taken in tea and coffee is difficult. In 196 cases, the records indicated, and the students confirmed at interview, that only the ration of milk was being taken, with the addition of small quantities in tea and coffee at outside restaurants. Ten students indicated that they were not getting two pints per week. Of these, five women and one man stated that they disliked milk and seldom had it, even in tea or coffee. The remaining four were in lodgings and thought that they were not supplied with their due of milk. Forty-seven students (18 per cent.) recorded over two pints per week in addition to milk in tea and coffee. Of these, eleven lived in the country with access to farms, twenty-eight ascribed their good fortune to having a "good" milkman, and eight confessed to living in homes where there was priority milk or had friends or relations who disliked milk. None of them was eligible for more than the standard ration. The findings are summarized in Table XV.

Of the 18 per cent. reckoned to have got more than two pints exclusive of milk in tea and coffee, the assessed intake is given in Table XVI.

TABLE XVI

RECORDED MILK CONSUMPTION OF STUDENTS WITH ACCESS TO AN EXTRA SUPPLY OF MILK

Pints of milk consumed per week	Number of students
2–2·9	15
3–3·9	13
4–4·9	9
5–5·9	4
6–6·9	3
7–7·9	1
8–8·9	1
over 9	1

Cheese was rationed at 2 oz. a head weekly. In contrast to bacon and milk, of which foods most of the students consumed approximately the allotted ration, there was wide variation in the taste for cheese. Almost one-third, with equal proportion of men and women, stated that they did not like cheese. Some never ate it at all and others only ate it in cooked dishes such as savouries, macaroni cheese, etc. There is considerable competition amongst cheese-eaters for the unconsumed ration of the cheese-haters. Some complicated bartering systems existed. A few students were eating two, three, or even four times the official

TABLE XV

MILK CONSUMPTION

	Numbers of students					
	Men		Women			
	Home	Lodgings	Home	Lodgings	Total	
Ration only	44	42	47	63	196	
Less than 2 pints						
Dislikes milk	1	—	3	2	6	10
Not provided	—	1	—	3	4	
More than 2 pints						
Lives near a farm	3	—	8	—	11	47
Has a "good" milkman	11	3	9	5	28	
Other sources	2	1	4	1	8	

ration, and would have liked more. Some of the big cheese-eaters got extra supplies from overseas parcels. The survey showed that the vagaries of human taste thwarted the good intentions of those who would equitably distribute this source of first-class animal protein.

The allocation of eggs in Edinburgh varied slightly during the period of survey, but an average of two per week was available from grocers. Table XVII shows the number of shell eggs recorded. Again there is no significant difference between those living at home and in lodgings. Only twelve students did not have at least one egg in the week, and, of these, two never ate eggs in any circumstances.

TABLE XVII

RECORDED CONSUMPTION OF EGGS

Number per week	Number of students	
	Men	Women
0	2	10
1	18	34
2	29	33
3	20	33
4	21	25
5	11	5
6	4	2
7 and over	3	3

Some reported that the week of the survey was exceptional in that an allocation of three or four eggs was made to compensate for previous deficits. Nevertheless, at least half the students had sources of supply beyond the allocation. Of these sources, back-garden hens and friends in the country were the commonest. In addition to shell eggs, dried egg powder was consumed by most students. This is often incorporated into puddings and cakes, and the amount eaten by individual students cannot be assessed accurately.

Fats.—During the survey the ration of fats was 8 oz. per week, of which 3 oz. were butter, 4 oz. margarine, and 1 oz. cooking fat. Table XVIII gives recorded consumption of fat spread on bread (table fat) but excludes fat used in cooking.

Fat rationing was strictly enforced at the time and few students had access to an extra-ration supply. Only two got extra fat from overseas parcels, and two more from farm butter. Nevertheless, as Table XVIII shows, at least a quarter of the students recorded a consumption greater than 6 oz. of table fat a week, which, allowing only 1 oz. of margarine for cooking, means that they almost certainly ate

TABLE XVIII

RECORDED CONSUMPTION OF TABLE FAT

Oz. consumed per week	Number of students	
	Men	Women
0	0	1
1	3	3
2	11	17
3	18	36
4	18	37
5	19	23
6	17	16
7	12	7
8 and over	10	5

more than their ration. They were probably able to do this because of unequal distribution within the household. For example, many of those in lodgings shared rooms with a fellow lodger, who did not eat his or her share. Many who are small bread-eaters do not require the full fat ration. Of the big fat-eaters living at home, most admitted to consuming part of their parents' ration, and one young man with a large appetite had, in addition, established a regular lien on a portion of his grandparents' fat ration.

Sugar and Jams.—During the period of the survey the sugar ration was 8 oz. and the jam ration 4 oz. a head weekly. The sugar was consumed mostly in tea, on porridge, and on puddings. Very few students had extra sources of supply, and the great majority consumed their ration, and their ration only, in this way. As regards jam consumption, there was wide variation. A few, especially amongst the small bread-eaters, did not eat their full ration, but many others consumed amounts considerably in excess of their weekly ration. This was to be expected since jam can be stored and in some families, apart from unequal consumption by individual members, substantial supplies of home-made jam are laid down during the fruit season.

Beverages.—The principal drink of students of both sexes was found to be tea. Diaries recorded an average consumption of tea seventeen times in the course of a week. Variations from this average were small, and it is quite exceptional for a student not to have tea at least twice a day. The majority have milk in their tea, and a large proportion of the milk ration is taken in this way.

Coffee is the second most important beverage, being taken on an average five times a week. However, many students drink it twice a day or more; others seldom or never. Coffee is drunk more in the Unions and restaurants than at home

or in lodgings. As these are frequented mostly by students living in lodgings, the latter consume more coffee than those living at home.

Cocoa was taken on an average twice a week but with wide individual variations. Not more than one-third of the students ever drank National Milk Cocoa.

Beer consumption is shown in Table XIX.

TABLE XIX

RECORDED BEER CONSUMPTION

Pints of beer drunk per week	Number of students	
	Men	Women
Never	54	78
Occasionally	30	60
1 pint	10	5
2 pints	2	—
3 pints	4	1
4 pints	3	—
5 pints and over	5	1

In addition small quantities of wine and spirits were taken by six men and twelve women. Of those taking part in the survey 83 per cent. of men and 91 per cent. of women stated that they either never drank or only did so on special occasions. These figures confirm a general impression that present-day Edinburgh students are both abstemious and sober. Apart from any other considerations, the high taxation on alcoholic drinks must restrict their consumption.

Tobacco.—At the interviews the students were asked their usual consumption of tobacco, and this is shown in Table XX.

TABLE XX

RECORDED NUMBER OF CIGARETTES SMOKED

Smoking	Number of students	
	Men	Women
Not recorded	21	16
Never	56	86
Occasionally	6	20
Cigarettes 5 a day	7	11
,, 10 a day	12	9
,, 20 a day	2	3
Tobacco 1 oz. per week	1	—
,, 2 oz. per week	2	—
,, 3 oz. per week	1	—

It will be seen that 62 (71 per cent.) of the men and 106 (82 per cent.) of the women never smoked or only did so occasionally. As in the case of alcohol, it is probable that high taxation acted as a deterrent.

THE PATTERN OF STUDENT MEALS

A statement such as we have given, of total food intake of a group of people over a short period, provides an incomplete picture of the quality of their diets. It is important to know also how food consumption is spread throughout the day, how many meals are taken, and how these are related to social customs and working habits. A reader of the classical literature of any country will be aware how variable and changeable such human food habits are.

The present surveys show that with rare exceptions Edinburgh students eat their food in three main meals. These are a breakfast in the early morning, usually between 7.30 and 8.30 a.m., a mid-day meal taken between noon and 1.30 p.m., and an evening meal between 5.30 and 8 p.m. In addition most students have light refreshment or a snack at least once during the day. Snacks are usually taken at the middle of the forenoon or the middle of the afternoon or late at night before retiring to bed. Thus there are students who eat six times a day, others who have only three meals, but the majority eat between four and five times a day. We know little about how these varying habits affect human well-being and effective working. Human physiology has no precise information about the size of meals or the intervals between them that are optima for health. That adequate opportunity for the eating of proper meals is essential for efficient working is now widely realized; many practical industrialists and combatant officers in the Services have given considerable thought to the pattern of the meals of the men and women for whose health they are responsible. An account of the distribution of students' food intake throughout the day is relevant to considerations of student health.

Breakfast.—The day is usually begun with a meal in which bread with butter or margarine and marmalade or jam, together with tea (or occasionally coffee) are consumed. In addition this meal may include either or both oatmeal porridge and a cooked dish. The latter is usually an egg, bacon, sausage, kipper, herring, or other fish, and is important as providing a supply of animal protein. Meals with these additions conform to traditional Scottish and English customs. Without them a breakfast can be described as continental. The table shows the percentage of students consuming

each type of breakfast. Not a few students had grapefruit on occasions, but otherwise fruit was rarely and vegetables hardly ever taken. Those who took porridge usually had the major portion of their milk ration at breakfast. The figures shown in the table are averages for the seven days in the week. Daily average figures show uniformity for the six weekdays, but on Sunday there is a great reduction in the number of those taking porridge and an increase in those eating cooked dishes—up to 80 per cent. of all students. Indeed, Sunday morning is frequently an occasion on which the limited week's ration of eggs and bacon is consumed in entirety.

TABLE XXI

PERCENTAGE OF STUDENTS CONSUMING A GIVEN TYPE OF BREAKFAST

	Men		Women	
	Home	Lodgings	Home	Lodgings
Porridge and cooked dish	20	41	8	19
Porridge only	29	11	13	9
Cooked dish	29	42	43	57
Continental type	22	6	36	15

These figures illustrate several features of students' breakfasts. Firstly, as already noted, they show that porridge is consumed regularly by only half the men and a small minority of the women. Secondly, more cooking for breakfast is done in lodgings than in the homes. Thirdly, men students tend to consume a more substantial breakfast than women. A striking feature is the large numbers who leave home for their day's work fortified only by tea or coffee and bread or toast. No less than 36 per cent. of women and 22 per cent. of men living at home come within this category. These have abandoned the traditional breakfasts of the country. The strict rationing of eggs and bacon and the limited supply of sausages and offal such as kidney, liver, etc., makes the task of procuring suitable foods for breakfast difficult and demands skill and patience in shopping. It is notable that in this respect landladies appear to be appreciably more effective than mothers. Some of those eating only small breakfasts do so from choice. They lie late in bed and have neither the time nor the inclination for a proper meal before setting out for work. These are for the most part girls. Those students who have to travel far from homes in the country must perforce rise earlier than others, yet they usually got good breakfasts.

The fact that large numbers of students come to classes without proper meals in the morning is an important factor contributing to the habit of taking mid-morning snacks.

The Mid-day Meal.—The great majority of students eat their mid-day meal either at a University Union or a city restaurant. This is shown in Table XXII.

TABLE XXII

PLACE OF TAKING MID-DAY MEAL

Students' living location	Percentage lunching out
In lodgings	86
At home 20 minutes or more from the University	80
At home within 20 minutes of the University	46

A small proportion of landladies (about 10 per cent.) provide mid-day meals for students. The majority only contract to supply lunches on Saturday and Sunday. Students living in such lodgings are therefore forced to go elsewhere for their mid-day meals.

The chief factor determining where a home-student eats at mid-day is the time available. This depends both upon travelling time and teaching schedules. Of the 130 students living at home, travelling times were as follows:

Twenty minutes or less	35%
21 to 30 minutes	29%
31 to 60 minutes	23%
Over one hour	13%

Those living more than twenty minutes away are all forced to find their lunch out, except for a few Arts students who only occasionally have a class in the afternoon and who can return home to lunch and study at leisure. In general the luncheon interval is ample in the Arts faculty, limited in the Medical faculty, and often very limited in the Science faculty and first year in Medicine. This is reflected in students' lunching habits. Thus 33 out of 57 (58 per cent.) Arts students living at home have mid-day meals at home, but only 3 out of 52 (6 per cent.) Medicals and 1 out of 23 Science students. The majority of these students who have the time prefer to go home for their mid-day meal rather than lunch out. How big this majority is we cannot be sure, but it certainly is not less than 58 per cent., the figure for all Arts students. On

being questioned, these have repeatedly assured us that there was always plenty of food at home. We looked for, but could find no correlation between the lunching habits and the number of ration books available to the housekeeper.

It was clear that the University Unions were more popular than city restaurants. On any given day the percentage of all students eating out, who used the Unions, was as follows:

Men living at home	87%
Men living in lodgings	71%
Women living at home	70%
Women living in lodgings	67%

Those who did not use the Unions all complained of the poor service and overcrowding there. They stated that they were able to get meals quicker elsewhere. There was almost unanimity amongst the men that the Union provided as good a meal at as cheap a price as any city restaurant. Most of the women supported this opinion, but a considerable minority complained of lack of variety in the menus and of lack of imagination in the cooking and catering. The main complaint was of the service, and this was undoubtedly insufficient in both Unions. The strictly enforced segregation of the sexes compelled a few students to seek their lunch outside the Union.

As regards the quality of the mid-day meal, great variations exist. We have arbitrarily defined a lunch as a meal consisting of (1) a helping of meat, egg, fish, or cheese, and (2) one helping of either potato, vegetable, or fruit, with the addition of (3) either a cooked pudding or soup. Any mid-day meal not fulfilling these standards has been called a snack. This distinction is based on custom and experience rather than nutritional standards. It has no quantitative significance and indeed many snacks provide more calories than some lunches. It is, however, a qualitative distinction of value. A snack, as we have defined it, usually is deficient in some of the essential dietary constituents, either animal protein, minerals, or vitamins. Consequently those students who only had snack meals at mid-day were dependent on extra sources of protective foods at breakfast or in the evening to balance their daily diet. The percentage having snack lunches were as follows:

Men living at home and eating out at mid-day	24%
Men living in lodgings and eating out at mid-day	31%
Women living at home and eating out at mid-day	28%
Women living in lodgings and eating out at mid-day	31%

It will be seen that just under one-third of the students obtain mid-day meals which leave a leeway to be made up by extra foods of higher nutritional value at other meals. The principal cause of this failure to obtain a proper lunch is the lack of staff and facilities at the Unions to serve lunches within the limited times available for the student. The Men's Union, the Women's Union, and the King's Building Common Room are all unable to meet demands in this respect. Students have repeatedly complained to us of the poor service in the main dining rooms. The majority of those who eat snacks do so because it enables them to get some food within the time available between classes. In general snack meals are cheaper than proper lunches and a few students may be economizing in this manner. We do not believe this to be an important factor. There have been no complaints about the prices charged in Unions: only one student has specifically admitted attempting to save money on lunch.

The Evening Meal.—Two distinct types of meal are served in the evening. These may be described as dinner and high tea. They have very different origins in social evolution. Dinner, for which we have used the same arbitrary criteria as those already laid down for lunch, is generally the main meal of the day for the household; it is the meal for which there is most cooking and preparation. For several generations it has been the custom of the upper strata of society, including the professional classes, to eat the main meal of the day in the evening. This was generally satisfactory for those households with an adequate domestic staff, but as more and more housewives have failed to obtain domestic assistance and have had to cook and prepare the family meals themselves, there has been an increasing tendency to follow the custom of the labouring classes and lower middle classes and make the mid-day meal the chief meal of the day. The evening meal is then usually a high tea, a meal which, in addition to bread, butter, jam and cakes, contains a cooked dish, usually providing a single source of animal protein, e.g. meat, sausages, cheese, fish, or egg. Characteristically no puddings or vegetables are taken. We have defined high tea as an evening meal not conforming to the criteria laid down for dinner, but containing one cooked dish. These distinctions are not hard and fast; on occasions it may be difficult to decide whether a given meal is really high tea or a dinner. Any meal which did not qualify as a high tea was regarded not as an evening meal but as a snack. This classification of meals will be seen to be essentially a distinction based on the amount of cooking involved in the

preparation of the meal, and not on its calorie content.

The figures arrived at by this means are given in Table XXIII. They represent percentages of the men and women in the four groups, and are overall figures for the week of the survey.

TABLE XXIII

PERCENTAGES OF STUDENTS HAVING DIFFERENT TYPES OF EVENING MEALS

	Men		Women	
	Home	Lodgings	Home	Lodgings
Dinner	16	34	10	35
High tea ..	72	67	70	55
No cooked meal	12	6	20	10
Two meals on same evening ..	6	5	2	1

This table shows, too, that a third of the students in lodgings have dinner regularly in the evening, and only one-eighth of those at home. Also the number of women students on any particular evening who did not get a cooked meal is nearly twice as large as the number of the men, with a maximum of one student in five for those women living at home. The fact that the majority of students had a high tea rather than a dinner would be of little significance nutritionally, if indeed they had previously had a satisfactory lunch. It is the combination of snack mid-day meal and high tea which is unsatisfactory. The numbers of students having this combination of meals on two or more of the five working days of the week was noted. Expressed as a percentage of the numbers in each group, they are given in Table XXIV. Such a combination inevitably means an inadequate consumption of vegetables during the day, and indeed is responsible for the large numbers of students, already referred to, who, throughout the week, have a small vegetable intake. Since the majority of students have no dinner at night, it becomes all the more important that arrangements should exist to enable them to get an adequate lunch.

Students in lodgings appear to have dinners at night more often than those at home. This, no doubt, is due to the fact that most landladies do not provide mid-day meals and instead cook in the evenings. Mothers prefer to do most of their cooking at mid-day.

TABLE XXIV

PERCENTAGE OF STUDENTS HAVING SNACK LUNCH AND HIGH TEA ON TWO OR MORE WORKING DAYS

	Home	Lodgings
Men	20	17
Women	25	16

The figures for those having two cooked meals in the same evening, and to a large extent those having no freshly cooked meal also, are accounted for by social engagements and other functions which upset the normal pattern of meals. Only nine students (five of them living at home) had as a regular feature of the diet no cooked food in the evening.

When analysed on the basis of days of the week the most striking feature of the data was the deterioration of the evening meals at the week-ends, both in the homes and in lodgings. A decrease in the number of students having dinner and an increase in those having no cooked food in the evening was very pronounced on Saturday and Sunday. This is related to the increased number eating cooked mid-day meals on these days.

Snacks.—In addition to the three main meals, most students had one or more snacks during the day. These snacks consist of either tea or coffee and a variety of buns and cakes. Very variable amounts of food were eaten. A few students obtain a considerable proportion of the total calories of their diet from snacks. Snacks characteristically contain no cooked meat or vegetables, but a little fruit was sometimes eaten. Three times were commonly set aside for snacks. Firstly, from 11 o'clock till 12 noon, when coffee is usually drunk; secondly, from 3.30 to 4.30 p.m. when tea is taken, which is often additional to the main high tea consumed later; lastly, at 10 p.m. or later, a majority of the students had a late snack, usually tea and buns.

TABLE XXV

PERCENTAGE OF STUDENTS CONSUMING SNACKS (AVERAGE OF SEVEN DAYS)

	Men		Women	
	Home	Lodgings	Home	Lodgings
Eleven o'clock ..	28	30	33	34
Afternoon tea ..	29	31	38	50
Late snack ..	70	79	71	73

This, no doubt, is associated with the early hour at which the evening meal is usually eaten in Edinburgh. About one-third have coffee, usually with a cake or bun, at mid-morning. The table shows that more women than men had an afternoon tea; this is a reflection of the fact that women more often than men miss a main cooked evening meal. On

such occasions afternoon tea had to do duty as the principal meal.

Discussion and Conclusions

1. A diet survey of 298 students under 21 years of age at Edinburgh University was carried out in December, January, and February, 1947-48. The survey was carried out by a log-book technique and each student's diet was recorded for one week.

2. There was no real shortage of calories or of energy-yielding foodstuffs. We did not find a single student who was unable to satisfy his or her appetite. While it can be stated with certainty that no student has normally gone to bed hungry, not a few have on occasions found their mid-day meals insufficient. Many students of both sexes consumed bread and potatoes in quantities far beyond the ration at the time of the survey. Had the supply of these two foods (at 63 oz. and 3 lb. per week respectively) been strictly confined to the individuals own domestic ration, many would have suffered discomfort and some real hardship.

3. Calculated recorded consumption of protein, animal protein, and fats seemed sufficient for health. This is not to say that many students would not have liked more.

4. The enforced consumption of bread made from National flour insured that intakes of vitamin B_1 were adequate. The consumption of calcium by most students was also sufficient.

5. The amount of fresh fruit and vegetables eaten was very variable and a minority of students ate small quantities of those foods. Ten per cent. of all students did not consume an average of three ounces a day of fruits and vegetables (excluding potatoes) together. This low intake of protective foods is reflected in an intake by some students of vitamin A and of vitamin C in amounts below acceptable physiological standards (Table III).

6. It is difficult to judge how these dietary deficiencies affect student health. It can be stated quite definitely that the quantities of vitamins consumed were always sufficient to prevent manifest clinical evidence of vitamin deficiencies in any of the students surveyed.

We investigated forty women medical students, most of whom had taken part in the survey, and showed that 10 per cent. suffered from mild anaemia (haemoglobin levels less than 90 per cent. Haldane). This finding is in no way unexpected. Indeed a proportion of women existing on diets such as have been described would be likely to have substandard haemoglobin levels.

7. The minority of students on an ill-balanced diet was evenly distributed amongst both sexes and amongst those living at home and in lodgings. The diets of those in University hostels were on the whole well-balanced.

8. From our interviews with students we would consider that a lack of elementary knowledge of human physiology was more important than a lack of money in determining bad feeding. Even at University level there is a real need for elementary health education.

9. At the start of the survey we were told that we should find many bad landladies. This has not proved so. The majority of landladies looked after their student lodgers well; not a few appeared to give food and services out of all economic proportion to the rent paid. In times of food shortages, such as the present, a great premium is put on domestic efficiency. A small minority of women failed to provide proper meals, but in our opinion the inefficient landlady is no more common than the inefficient mother.

10. Some students come from broken homes, in which one or both parents were absent, either on account of death or matrimonial separation or distant employment. The absence of either parent from the home was found usually, but not inevitably, to be reflected in inferior feeding. Irregular meals, limited cooking, and unsatisfactory diets were observed in broken homes.

11. The facilities provided at the University Unions and the Science Buildings Common Room for mid-day meals were inadequate. Poor mid-day meals were a feature of many bad diets. Large numbers of students had no proper lunch. This was in no way the fault of the catering staffs who, for the most part, were doing excellent work with insufficient accommodation and equipment.

12. The survey showed that, judged by chemical standards, the diets of the majority of the students were satisfactory. We were perhaps more impressed by the social aspects of the feeding of students. Each evening most students sup quietly at home with their families or in their lodgings. Exceptions to this are few even on Saturday nights. Undergraduate parties are *not* a feature of University life today in Edinburgh. We have already mentioned that four out of five men and nine out of ten women passed the week without being exposed to the socializing influence of alcohol. The garnishings of meals are absent. In Edinburgh University today a meal is a physiological action; it is rarely a social occasion. The social and economic factors which have brought about these changes are not within our present scope. We simply record that food no longer serves as a background for that essential function of a university—the exchange of ideas.

The authors wish to express their appreciation to many members of the University staff for providing facilities for the surveys and to the students for their willing co-operation. They were assisted in the field work by Miss K. Chamberlain, B.Sc., Miss J. Davison, B.Sc., Miss N. Henry, B.Sc., and Miss M. Scott, by members of the staff of the Scientific Adviser's Division of the Ministry of Food, and by Mr. J. A. H. Lee, B.Sc., and Mr. J. G. Parish, M.B., of the University.

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MORTALITY FROM RHEUMATIC HEART DISEASE IN CHILDREN AND YOUNG ADULTS IN ENGLAND AND WALES

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Introduction

In the last few years considerable attention has been paid to the rheumatic diseases and, in particular, rheumatic fever. Glover (1943, 1946) has shown that the mortality from the latter has declined considerably in the last sixty years and that recently this decline has been accelerated. On these grounds he called acute rheumatism an obsolescent disease. In contrast, Morris and Titmuss (1942), Parkinson (1945), and Ryle (1946) have called attention to the heavy toll still taken by rheumatic heart disease, and to the fact that adolescents and young adults are its main victims.

Considerable local and regional differences in the mortality from rheumatic heart disease have been observed in England and Wales (and also in morbidity), and in an attempt to determine the aetiology many workers have related these differences to social and environmental conditions. Poverty has been among the chief factors incriminated. Reports issued some twenty years ago by the Ministry of Health (1927) and the Medical Research Council (1927) agree that acute rheumatism rarely attacks the children of well-to-do parents. Morris and Titmuss hold the view that " the whole complex of poverty " is involved in the production of juvenile rheumatism, and Daniel (1943), in his study of rheumatic heart disease in Bristol, concluded that there was a significant association between its incidence and low family income. The suggestion in the Medical Research Council's report that the incidence was greatest in the artisan class is supported by Wilson (1940) but denied by Morris and Titmuss.

Bad housing has also been condemned as a cause of acute rheumatism, but the evidence incriminating dampness, ill-ventilation, living in basements, and other features is not clear. Overcrowding is often associated with bad housing, and some authorities have held this factor to be important. In the Medical Research Council's inquiry (1927) no difference was found in overcrowding levels between rheumatic and non-rheumatic families, and Morris and Titmuss, comparing the mortality rates from heart disease in regions of England and Wales, found the correlation with overcrowding inconclusive. Savage (1931) also found no significant association between the incidence of rheumatic heart disease and crowding but, on the other hand, Perry and Roberts (1937) showed that the incidence of rheumatic heart disease in different wards of Bristol was highly and significantly correlated with the average number of persons per room. Daniel, in his more detailed study of the same city, confirmed this relationship. Clarke (1940) considered that in Dublin juvenile rheumatism was not essentially a disease of poverty but coincided with overcrowding and proximity to low-lying areas.

The importance of other factors such as climate, nutrition, maternal care, and heredity is difficult to assess but each has been considered by various authors. It is, therefore, impossible to reach definite conclusions from the evidence already available and, in particular, it seems that more information is required on the effects of poverty and housing. In this respect it would clearly be preferable to study the morbidity from rheumatic heart disease and its relation to these factors, but as yet notification of rheumatic fever and its sequelae is too recent and too localized to be of value. Morbidity statistics are otherwise dependent on special surveys, such as those of Savage, Perry and Roberts, and Daniel. The present study, therefore, is limited to mortality data published by the Registrar-General for England and Wales.

The Available Mortality Data

In the Annual Statistical Reviews of the Registrar-General there is no separate classification of deaths due to rheumatic heart disease before 1940, when the fifth Revision of the International List of Causes of Death was introduced. Even then only those

* Holding a Rockefeller Foundation Fellowship.

TABLE I

MORTALITY FROM RHEUMATIC FEVER IN ENGLAND AND WALES, 1921-38

	5-14 years			15-24 years			25-34 years		
	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate
Males									
1921-23	754	71	100	489	51	100	282	36	100
1924-26	753	75	106	513	51	100	217	27	75
1927-29	671	66	93	422	41	80	194	23	64
1930-32	594	60	85	395	39	76	197	22	61
1933-35	582	59	83	334	35	69	198	20	56
1936-38	456	49	69	319	32	63	187	19	53
Females									
1921-23	840	80	100	658	63	100	295	31	100
1924-26	926	94	118	637	60	95	320	33	106
1927-29	808	81	101	588	56	89	297	30	97
1930-32	655	68	85	504	48	76	276	27	87
1933-35	720	74	93	468	48	76	256	25	81
1936-38	573	63	79	362	37	59	206	20	65

deaths for which rheumatism was specifically mentioned on the death certificate are so classified, excluding many for which a rheumatic origin is implied but not stated. From 1921 to 1930 the third Revision (1920) of the International List was in use, and from 1931 to 1939 the fourth Revision (1929). Both these lists include a group of causes, "Heart Diseases," for which deaths are tabulated for different administrative areas—county and other boroughs, counties, urban and rural districts. For the country as a whole the Registrar-General at the same time tabulated the deaths in sub-divisions of this large group. Although the change from the third to the fourth Revision of the International List involved alterations in the sub-divisions, the whole group, Heart Diseases, was practically identical in the two lists. Thus the deaths from heart disease in England and Wales were classified under the following sub-divisions in the fourth Revision:

International List No. 90 Pericarditis.
" " No. 91 Acute endocarditis.
" " No. 92 Chronic endocarditis, valvular disease.
" " No. 93 Diseases of the myocardium.
" " No. 94 Diseases of the coronary arteries, angina pectoris.
" " No. 95 Other diseases of the heart.

In young persons the deaths from the first three sub-divisions, numbers 90, 91, and 92, are almost entirely rheumatic in origin, while those due to causes numbers 93 and 94 are generally not rheumatic. Tabulation of the deaths for the years 1931-33 shows that at ages 5 to 14 years over 90 per cent. of deaths debited to heart disease fell under the headings of numbers 90, 91, and 92. At ages 15 to 24 years 86 per cent. were so classified, and at ages 25 to 34 years 76 per cent. On the other hand at ages 35 to 44 years the proportion falls to only 54 per cent. It can reasonably be assumed, therefore, that, up to the age group 25 to 34 years, the broad group entitled heart diseases is a fair measure of the mortality from rheumatic heart disease. This is in confirmation of the generally accepted opinion that below 40 years of age nearly all deaths from heart disease are of rheumatic origin.

It may also be noted that the mortality rates used in this study have not been extended beyond 1938 for two reasons: (*a*) In subsequent years both the deaths recorded in the Statistical Reviews and the estimated populations of England and Wales refer only to civilians. (Even where a separate table shows the number of deaths among non-civilians, the population at risk is not readily obtainable.) In two of the age groups to be studied the rejection from service in the Armed Forces of those physically unfit might well have influenced the recorded mortality rates considerably, particularly as heart

disease or previous rheumatic fever was a common ground for rejection; (*b*) a further complication lay in the introduction by the Registrar-General in 1940 of the fifth Revision (1938) of the International List already mentioned, and also in the change made at the same time in the manner of selecting the assigned cause for tabulation when more than one cause is mentioned on the death certificate. The effect of these changes has been to reduce the number of deaths assigned to heart diseases, so that rates for 1940 and later years are not directly comparable with those up to 1939. Conversion ratios calculated and published by the Registrar-General for comparison of rates before and after 1940 are applicable to rates at all ages but could not safely be used for the selected age groups studied here or for particular areas.

The Trend of Mortality in England and Wales

Table I shows the average annual mortality rates from rheumatic fever per million persons living (males and females separately) in England and Wales for each of the six triennia 1921-23 to 1936-38 for the age groups 5 to 14, 15 to 24, and 25 to 34 years. Table II is similarly prepared to show the mortality from heart diseases, while Table III combines the two. One clear characteristic of the rates shown in these tables is their rather higher level for females compared with males. Owing to some sex differences in the time trends of mortality the female excess varies somewhat in degree but, apart from the triennium 1921-23, it is invariably present. Ignoring this triennium the total rate for rheumatic fever and heart disease combined shows an almost constant female excess mortality of 20-25 per cent. at ages 5 to 14, a similar though rather more varying excess of 15 to 25 per cent. at ages 15 to 24, and one of 20 to 30 per cent. at ages 25 to 34. The discrepancy in 1921-23, in which years the rates on males aged 15 to 24 and 25 to 34 appear unduly high, might possibly be a function of the 1914-18 war, through males being thereby more exposed to the risks of contracting rheumatic fever and of subsequently dying from it. In view of this curiously high and seemingly abnormal rate on males it will also be as well to consider the trend of their mortality from 1924-26 onwards, though the rates have, it will be noted, been expressed as a ratio to those of 1921-23.

Turning to this trend (see also Figs. 1 and 2) the following characteristics may be observed:

(*a*) *Ages 5 to 14.* Mortality rates both from rheumatic fever and from heart disease were declining between 1924-26 and 1930-32. There was, however, a clear set-back, with a rise in mortality, in 1933-35; this was followed by an accelerated decline. Taking the combined deaths of Table III, both sexes show a reduction of mortality of nearly one-third between 1921-23 and 1936-38, and their movements throughout the period have been almost identical.

TABLE II

Mortality from Heart Disease in England and Wales, 1921-38

	5-14 years			15-24 years			25-34 years		
	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate
Males									
1921-23	1,287	122	100	2,261	237	100	3,163	407	100
1924-26	1,130	113	93	1,895	188	79	2,200	278	68
1927-29	1,068	106	87	1,950	189	80	2,246	270	66
1930-32	950	96	79	1,929	189	80	2,239	245	60
1933-35	1,047	105	86	1,816	187	79	2,388	243	60
1936-38	757	81	66	1,741	177	75	2,317	232	57
Females									
1921-23	1,668	159	100	2,353	225	100	2,972	314	100
1924-26	1,355	137	86	2,312	218	97	2,989	309	98
1927-29	1,316	133	84	2,500	236	105	3,124	318	101
1930-32	1,212	125	79	2,475	236	105	3,254	324	103
1933-35	1,258	129	81	2,285	232	103	3,264	315	100
1936-38	902	99	62	2,042	207	92	3,110	297	95

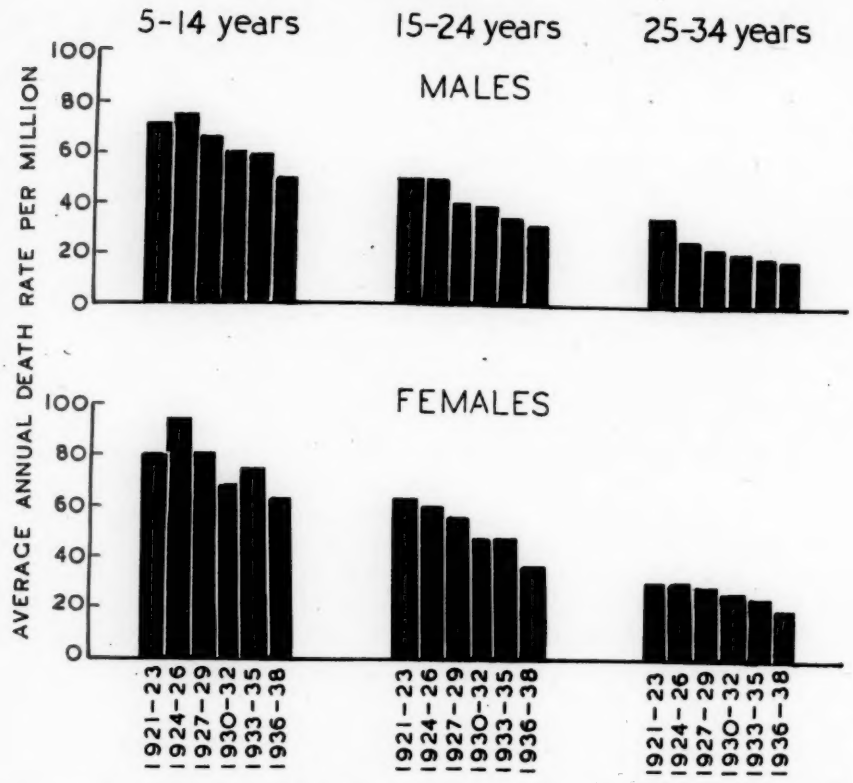

FIG. 1.—The trends in mortality from rheumatic fever in England and Wales, 1921-38, in age groups 5 to 14, 15 to 24, and 25 to 34 years.

TABLE III

MORTALITY FROM RHEUMATIC FEVER AND HEART DISEASE COMBINED IN ENGLAND AND WALES, 1921-38

	5-14 years			15-24 years			25-34 years		
	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate	Total deaths in triennium	Average annual death rate per million persons living	% of 1921-23 rate
Males									
1921-23	2,041	193	100	2,750	288	100	3,445	443	100
1924-26	1,883	188	97	2,408	239	83	2,417	306	69
1927-29	1,739	172	89	2,372	230	80	2,440	294	66
1930-32	1,544	156	81	2,324	228	79	2,436	267	60
1933-35	1,629	164	85	2,150	222	77	2,586	263	59
1936-38	1,213	130	67	2,060	209	73	2,504	251	57
Females									
1921-23	2,508	240	100	3,011	288	100	3,267	345	100
1924-26	2,281	230	96	2,949	278	97	3,309	342	99
1927-29	2,124	214	89	3,088	292	101	3,421	348	101
1930-32	1,867	192	80	2,979	285	99	3,530	351	102
1933-35	1,978	203	85	2,753	280	97	3,520	340	99
1936-38	1,475	162	68	2,404	244	85	3,316	317	92

(*b*) *Ages 15 to 24.* At these ages the trend has clearly been less favourable than that found for schoolchildren. The death rates attributed directly to rheumatic fever have, it is true, declined more rapidly than at ages 5 to 14, but those due to heart disease—and these form the larger component—have shown practically no change in either sex between 1924-26 and 1936-38. The sum of the two shows a slightly falling rate for males from 1924-26 onwards (ignoring the unduly high rate of 1921-23), while for females there is virtually no change between 1921-23 and 1933-35 but some decline in the final three years, 1936-38.

(*c*) *Ages 25 to 34.* These ages give very much the same picture as the previous group, namely a steady and considerable decline in the deaths attributed directly to rheumatic fever from 1924-26 onwards but relatively little change, particularly for women, in heart disease, which is numerically much the more important group. In total, therefore (again ignoring for reasons given the male figure for 1921-23) there has been only a slight decline in the death rate of males and practically no improvement at all in the death rate of females.

This general inter-war picture is hardly a favourable one. It seems that the substantial fall since 1924-26 in rheumatic fever mortality in each age group and for each sex was largely offset except at the school ages by the lack of decline in the mortality from the heart disease attributable to rheumatic fever. At the school ages, 5 to 14, there was indeed quite substantial improvement in total though some of this was concentrated in a rather sharp fall in the final period 1936-38. At ages 15 to 24 and 25 to 34 there was likewise an improvement in 1936-38; but, apart from this, male mortality was declining only very slowly and female mortality was not declining at all.

Mortality in Administrative Areas

It is possible to extend, at least in part, this study of the time changes in mortality since the Registrar-General publishes deaths in regions, county boroughs and rural and urban districts of counties according to an abridged list of causes which includes heart disease as one group. This list does not include rheumatic fever which must, therefore, be left out of account. The average annual mortality rates from heart disease have accordingly been calculated for London Administrative County, all County Boroughs, all Urban Districts, and all Rural Districts for the three age groups under study and for the periods 1920-22, 1930-32, and 1936-38. For the first two periods the average annual deaths in the three years were divided by the census populations of 1921 and 1931 respectively. In the last period the populations had to be estimated on the assumption that the age distribution in all County Boroughs, Urban, and Rural Districts was the same as that in the County Boroughs, Urban, and Rural Districts outside Greater London, estimates of these latter populations being given by age and sex in the Registrar-General's Text volume. These rates and corresponding figures for all England and Wales are set out in Tables IV, V, and VI and shown graphically in Fig. 3.

The level of mortality in relation to urbanization may first be noted, and it will be seen that in each of the three age groups London Administrative County had the highest rate in 1920-22 (except

TABLE IV

Mortality from Heart Disease, 5 to 14 years, in Administrative Regions of England and Wales in the Triennia 1920-22, 1930-32, and 1936-38

	Males					Females				
	Average annual death rate per million persons living					Average annual death rate per million persons living				
	England and Wales	London Administrative County	County Boroughs	Urban Districts	Rural Districts	England and Wales	London Administrative County	County Boroughs	Urban Districts	Rural Districts
1920-22	132	182	148	134	76	173	236	207	160	104
1930-32	96	94	116	97	63	125	140	148	120	88
1936-38	81	100	103	69	57	99	99	126	90	64
	Rate as percentage of 1920-22 rate					Rate as percentage of 1920-22 rate				
1920-22	100	100	100	100	100	100	100	100	100	100
1930-32	73	51	79	73	83	72	59	72	75	84
1936-38	62	55	70	51	75	57	42	61	56	61

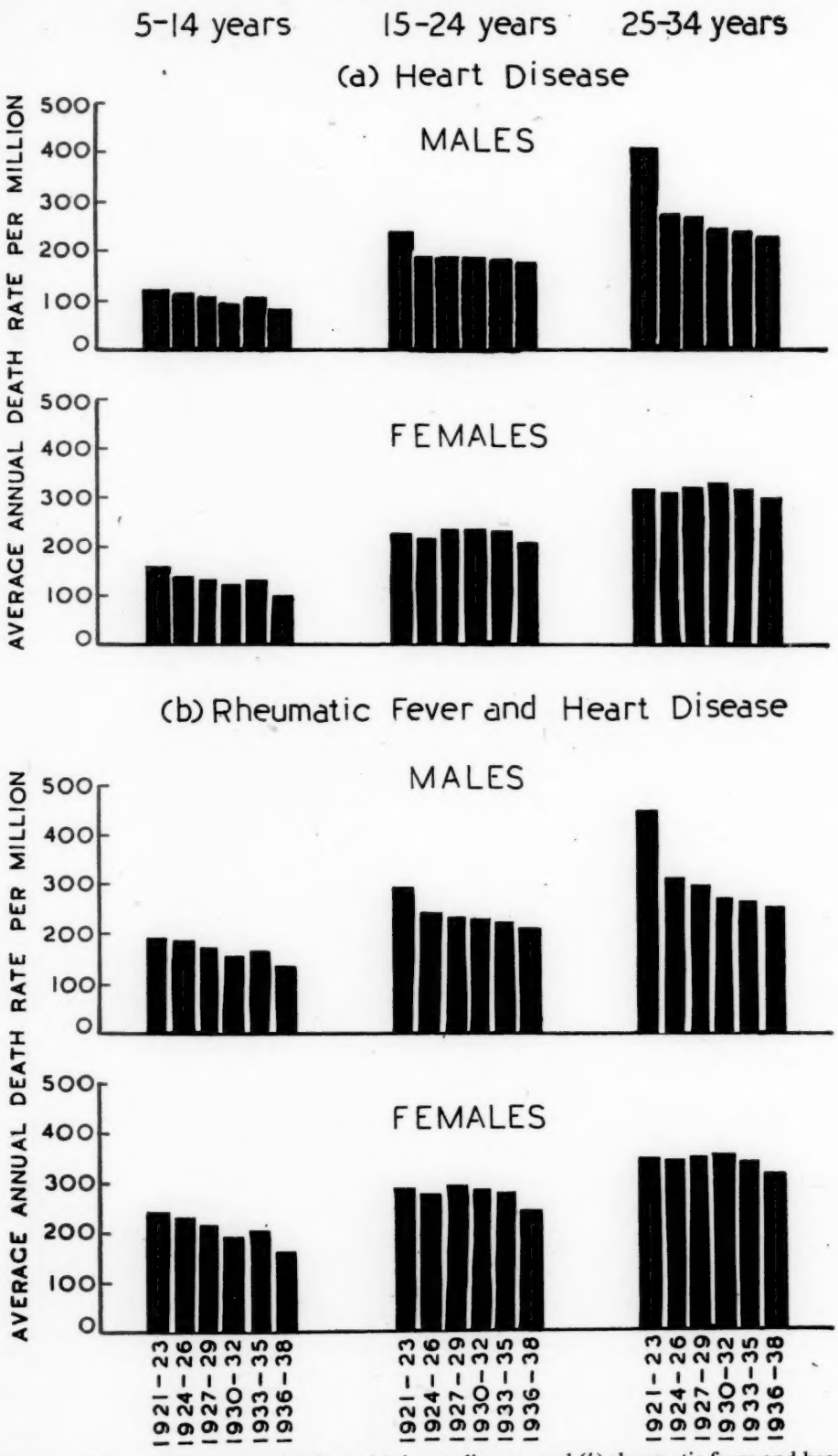

FIG. 2.—The trends in mortality from (*a*) heart disease, and (*b*) rheumatic fever and heart disease in England and Wales, 1921-38, in age groups 5 to 14, 15 to 24, and 25 to 34 years.

females, 25 to 34) followed, in order, by the County Boroughs, the other Urban Districts and the Rural Districts. The death rate of the rural areas is particularly low at ages 5 to 14, when it is only about one-half the rate in the large towns; this advantage falls with increasing age, but it is still considerable at ages 15 to 24 and 25 to 34. With the passage of time this order of mortality has not remained constant, but it appears that the changes lie almost entirely in the discrepant behaviour of the rates for London. The other types of areas show death rates for each sex, each age, and each period consistently in the order County Boroughs, Urban Districts, Rural Districts, and their rates of decline between 1920-22, 1930-32, and 1936-38 have, on the whole, been noticeable rather for their general consistency than for their divergencies (though an occasional divergence is apparent). Thus, taking the rates in 1936-38 as a percentage of the corresponding rates in 1920-22 for County Boroughs, Urban Districts, and Rural Districts gives (in that order) the following ratios: 5 to 14: males, 70, 51, 75, females, 61, 56, 61; 15 to 24: males, 75, 68, 71, females, 98, 83, 87; 25 to 34: males, 54, 53, 45, females, 89, 92, 85. As was noted previously for the country as a whole, there has been in each of these aggregate of areas (*a*) a substantial fall in the death rate at the school ages, (*b*) relatively little improvement for females either at ages 15 to 24 or at ages 25 to 34, (*c*) for males of these ages a sharp fall in mortality from the high, and possibly abnormal, rates of 1920-22 but only a very slight further decline between 1930-32 and 1936-38.

Turning to the County of London it will be seen that at school ages its relatively high death rate fell at first for both sexes more rapidly than the rates for the other administrative divisions; indeed between 1920-22 and 1930-32 its mortality was nearly halved. In the ensuing six years no further improvement is found for boys, but there was a still further considerable decline for girls. Passing to ages 15 to 24, males again show a more rapidly falling death rate than is apparent for the country as a whole, but this improvement took place almost entirely up to 1930-32. On the other hand the death rate of young women from heart disease showed, in common with the rest of the country, virtually no change between 1920 and 1932 and then an abrupt fall between 1932 and 1938 not apparent in the other areas. Finally, at ages 25 to 34, there is no very material difference between the mortality trends of London and elsewhere though the rate has fallen slightly more in London than in the other large towns. As one result of these somewhat curious changes the death rates in London, which were in 1920-22 the highest, were in 1936-38 a little below those of the aggregate of the large provincial cities. There is no obvious reason why London should have been subject to such relatively high rates in 1920-22 nor why its trend of mortality should have departed so materially from the uniformity revealed by the other groups of areas. It might be thought that the answer to the second question might well lie in the special scheme for the treatment and care of cases of rheumatic fever introduced in 1926 by the London County Council. It is possible, however, to examine the mortality trends in the Greater London area within and without the scope

TABLE V

MORTALITY FROM HEART DISEASE, 15 TO 24 YEARS, IN ADMINISTRATIVE REGIONS OF ENGLAND AND WALES IN THE TRIENNIA 1920-22, 1930-32, AND 1936-38

	Males					Females				
	Average annual death rate per million persons living					Average annual death rate per million persons living				
	England and Wales	London Administrative County	County Boroughs	Urban Districts	Rural Districts	England and Wales	London Administrative County	County Boroughs	Urban Districts	Rural Districts
1920-22	252	342	285	245	167	240	293	268	227	176
1930-32	188	211	216	185	132	234	288	270	214	166
1936-38	177	200	213	167	118	207	194	262	188	154
	Rate as percentage of 1920-22 rate					Rate as percentage of 1920-22 rate				
1920-22	100	100	100	100	100	100	100	100	100	100
1930-32	74	62	76	75	79	98	98	101	94	94
1936-38	70	58	75	68	71	86	66	98	83	87

TABLE VI

MORTALITY FROM HEART DISEASE, 25 TO 34 YEARS, IN ADMINISTRATIVE REGIONS OF ENGLAND AND WALES IN THE TRIENNIA 1920-22, 1930-32, AND 1936-38

	Males					Females				
	Average annual death rate per million persons living					Average annual death rate per million persons living				
	England and Wales	London Administrative County	County Boroughs	Urban Districts	Rural Districts	England and Wales	London Administrative County	County Boroughs	Urban Districts	Rural Districts
1920-22	457	537	493	435	388	339	369	391	315	267
1930-32	243	284	275	235	181	324	360	359	314	253
1936-38	232	240	267	230	176	297	318	347	288	227
	Rate as percentage of 1920-22 rate					Rate as percentage of 1920-22 rate				
1920-22	100	100	100	100	100	100	100	100	100	100
1930-32	53	53	56	54	47	96	98	92	100	95
1936-38	51	45	54	53	45	88	86	89	92	85

of the Council's scheme. Table VII (for which I am indebted to Professor Bradford Hill, unpublished data) shows that at ages 5 to 14 and 15 to 24 the death rate has actually fallen rather more rapidly in areas outside the scheme than in the County areas within it. The fall in London appears, therefore, to be a local phenomenon and not easily explained.

MORTALITY FROM HEART DISEASE IN SPECIFIC COUNTY BOROUGHS

In view of the fact that mortality has been found to be related to the degree of urbanization of the different areas, an attempt has been made to go a step further and to measure the importance of social and environmental factors in rheumatic heart disease. This has been done by correlating the heart disease mortality at ages 15 to 34 years in certain county boroughs with measurable conditions of their population. The factors selected were:

(i) Social index, i.e. the proportion per 1,000 total employed males aged 14 years and over belonging to the Registrar-General's Social Classes IV and V. (*Registrar-General*, 1934.)

(ii) Persons per room, 1931.

(iii) Number of persons per 1,000 living at a density of more than two persons per room, 1931.

(iv) Latitude.

The first three of these environmental measures are based on the 1931 census of population (the latest available data for the purpose); the mortality rates have therefore been calculated for about the same time. It was found that there were so few deaths from heart disease in individual county boroughs at ages 5 to 14 years that reliable rates for this age group could not be calculated. To obtain rates based on an adequate number of deaths (as far as possible not less than 20) the age groups 15 to 24 years and 25 to 34 years were combined to give one group 15 to 34 years, and a group of 30 county boroughs was selected by taking all those whose

TABLE VII

DEATH RATES FROM HEART DISEASE PER MILLION LIVING IN LONDON A.C. AND THE REST OF GREATER LONDON

	5-14 years				15-24 years			
	London A.C.		Rest of Greater London		London A.C.		Rest of Greater London	
	Death rate	% of 1921-22	Death rate	% of 1921-22	Death rate	% of 1921-22	Death rate	% of 1921-22
1921-22	205	100	160	100	308	100	241	100
1931-32	109	53	82	51	249	81	184	76
1933-35	148	72	93	58	227	74	159	66
1936-38	99	48	65	41	197	64	131	54

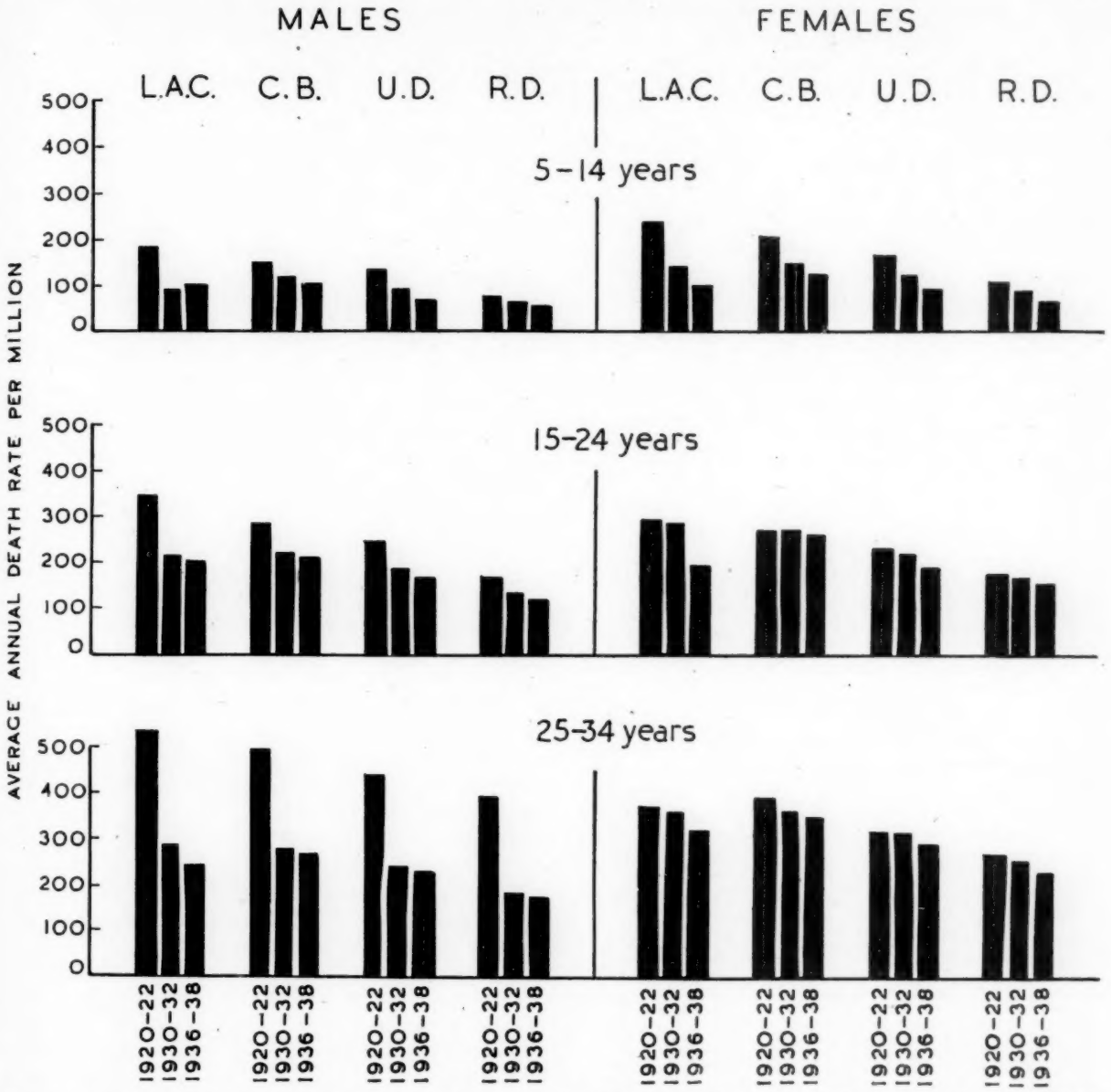

FIG. 3.—Mortality from heart disease in administrative divisions of England and Wales in the triennia 1920-23, 1930-32, and 1936-38 in age groups 5 to 14, 15 to 24, and 25 to 34 years.

populations in this age group were not less than 20,000 males and 20,000 females (the smallest town selected was Wolverhampton with a population at all ages of 133,190). A mean annual death rate, for males and females separately, was calculated by taking these deaths from heart disease age 15 to 34 in 1931, 1932, and 1933 and relating them to the 1931 census population in the same age group. (The triennium 1930-32 would have been preferable but in 1930 the deaths in this age group were not available.) The resulting rates for males varied from 64 per million in Brighton to 396 per million in Swansea, with an unweighted average for the 30 towns of 242 per million. For females the rates varied from 177 for Brighton to 496 per million for Middlesbrough, with an unweighted average of 320 (see Table VIII).

The correlation coefficients between these rates and the four environmental variables are shown in Table IX, together with the inter-correlations between the four social and environmental factors themselves. The significance of the coefficients is

shown both by their standard errors and by the "t" test. The coefficients for males and females are, it will be seen, very similar, those between (*a*) mortality and the social index, and (*b*) between mortality and latitude, all being of the order +0·5, and significant; with the two housing indices on the other hand, the coefficients were only about 0·2 to 0·3, and not significant. As would be expected, the inter-correlation coefficients between the four social and environmental indices were positive and significant, the lowest being that between persons per room and latitude, +0·44, the highest +0·94 between the two housing indices. To allow for these relationships and to assess, so far as possible, the relative influence of the factors measured by the four indices, partial correlations were calculated and are shown in Tables X and XI.

The coefficient between male mortality and social index was +0·48 (Table IX). Keeping constant the overcrowding rates, as measured by persons per room, the coefficient is slightly reduced, to +0·39, but is still significant (Table X). The corresponding coefficients for females are 0·54 and 0·47, the latter being still significant. Replacing persons per room by the other housing index, proportion at more than two persons per room, the partial coefficients between mortality and social index again remain significant at +0·42 for males and +0·53 for females. There was, therefore, in these years an association between the heart disease mortality of each sex in these 30 county boroughs and their social indices, a relationship which appeared to be almost independent of the overcrowding index of the towns.

Similarly, for both sexes, the observed relationships between heart disease mortality and latitude are not greatly affected by assuming constant housing indices in the 30 towns; the partial correlations are of the order of +0·45, and significant, while without constant housing indices "r" was of the order of +0·5. Although latitude and housing indices are significantly correlated (Table IX), there being in general a poor standard of housing in the northerly towns, the association between heart disease mortality and latitude cannot, it seems, be explained merely by these differences in housing standards.

Keeping constant the social index in these towns the partial coefficients between mortality and latitude became +0·36 for males and +0·30 for females, neither of which are technically significant. On the other hand, the partial coefficients between mortality and social index, latitude being kept constant, were +0·30 for males and +0·40 for females, the latter being significant.

Lastly, the association between mortality and the housing indices was found to be weak, the coefficients being only 0·2 to 0·3. The partial coefficients when social index or latitude in the 30 towns is kept constant are practically zero. The relationship between heart disease mortality and housing indices appears therefore to be fortuitous, being an expression of the bad housing conditions in the more northerly towns and their natural association with lower social classes. It seems that the housing conditions *per se* had little effect on the mortality from rheumatic heart disease in these large towns.

In short, then, this analysis reveals no association in these 30 large towns between their mortality rates from heart disease in 1931-33 and their concurrent overcrowding indices, but a moderate and significant degree of association between their mortality and both their latitude and their proportion of persons belonging to the two classes lowest in the social

TABLE VIII

MORTALITY FROM HEART DISEASE, AT AGES 15 TO 34 YEARS, IN THIRTY COUNTY BOROUGHS, 1931-33

County Borough	Latitude	Average annual death rate, 1931-33, per million persons living	
		Males	Females
Plymouth	50° 23′	140	204
Portsmouth	50° 48′	149	262
Brighton	50° 49′	64	177
Southampton	50° 55′	181	203
Croydon	51° 22′	138	193
Bristol	51° 27′	183	274
Cardiff	51° 28′	227	268
East Ham	51° 32′	224	342
West Ham	51° 32′	251	432
Swansea	51° 37′	396	322
Coventry	52° 25′	193	246
Birmingham	52° 29′	194	265
Wolverhampton	52° 35′	274	252
Leicester	52° 39′	218	289
Derby	52° 56′	244	281
Nottingham	52° 57′	261	342
Stoke-on-Trent	53° 1′	346	381
Sheffield	53° 23′	309	334
Birkenhead	53° 23′	336	339
Liverpool	53° 24′	319	447
Manchester	53° 29′	310	349
Salford	53° 30′	219	492
Oldham	53° 33′	251	479
Bolton	53° 35′	304	488
Kingston-upon-Hull	53° 45′	282	262
Bradford	53° 48′	204	287
Leeds	53° 48′	290	352
Middlesbrough	54° 35′	259	496
Sunderland	54° 55′	272	241
Newcastle-on-Tyne	54° 59′	212	306

scale. Table XII broadly illustrates these associations by showing the unweighted average mortality rates in these 30 towns grouped according to their social index and their latitude. It will be seen that for females in all three latitude groups and for males in the most southerly and middle latitude groups the average mortality rate steadily increased as the proportion of employed males in the lowest social groups increased. For females the average mortality in the groups with social index under 350 and 350-399 increased with northerliness but for males this association held for the social index under 350 group and only partly for the other two groups.

It is difficult to tell exactly what is measured by the social index and therefore the meaning of its association with the heart disease mortality. In the depression years of the early 1930's there was considerable unemployment, particularly among the lower social classes, and although unemployment is not taken into account in the calculation of the social index it must have been considerable where there was a large proportion of the working population in classes IV and V. The correlation with the social index might indicate, therefore, a high rate of mortality where nutrition in a town was poor. Alternatively, an unfavourable social index might indicate lower standards of nursing and care of affected persons and therefore be correlated with increased mortality. There is nothing here to indicate whether a higher incidence or a higher fatality rate accounted for the higher mortality rates in some towns, though the studies in Bristol suggest that, where social and environmental conditions are poor, incidence is increased. Whether the fatality rate is also high cannot be determined.

The relationship between heart disease mortality and latitude was independent of the housing indices but was affected by variations in the social index. It is possible that if the social index were a better measure of the factors responsible for increased heart disease mortality, the correlation of mortality with latitude would have disappeared when the social index was kept constant. The coefficients were, in fact, not significant technically, but their uniformity suggests that latitude exerted some influence independent of overcrowding or social class. Behind it may, perhaps, lie a climatic factor and some aspect of poverty not comprised in the social index.

Further enquiry is clearly necessary to explain the relationships between heart disease mortality at these young ages, mainly rheumatic in origin, and social and environmental factors. The conflicting evidence from many authorities suggests that the answer is unlikely to lie in a single factor, that none such in isolation could account for the great local differences in the incidence of mortality. One of the chief obstacles to solving this and other

TABLE IX

CORRELATION COEFFICIENTS BETWEEN HEART DISEASE MORTALITY, 15 TO 34 YEARS, AND SOCIAL AND ENVIRONMENTAL FACTORS IN THIRTY COUNTY BOROUGHS, 1931-33

	r	Standard error	t	
Males				
Heart disease mortality and social index	+0·48	±0·14	2·88	P<·01
Heart disease mortality and persons per room	+0·30	±0·17	1·66	0·1<P<·2
Heart disease mortality and proportion at more than 2 persons per room	+0·24	±0·17	1·33	0·1<P<·2
Heart disease mortality and latitude	+0·51	±0·14	3·16	P<·01
Females				
Heart disease mortality and social index	+0·54	±0·13	3·43	P<·01
Heart disease mortality and persons per room	+0·32	±0·16	1·77	0·05<P<·1
Heart disease mortality and proportion at more than 2 persons per room	+0·19	±0·18	1·00	0·3<P<·4
Heart disease mortality and latitude	+0·49	±0·14	2·99	P<·01
Social and Environmental Factors				
Social index and latitude	+0·50	±0·14	3·06	P<·01
Social index and persons per room	+0·61	±0·12	4·07	P<·01
Social index and proportion at more than 2 persons per room	+0·54	±0·13	3·35	P<·01
Latitude and persons per room	+0·44	±0·15	2·59	0·01<P<·02
Latitude and proportion at more than 2 persons per room	+0·52	±0·13	3·23	P<·01
Persons per room and proportion at more than 2 persons per room	+0·94	±0·02	14·94	P<·01

TABLE X

PARTIAL CORRELATION COEFFICIENTS BETWEEN HEART DISEASE MORTALITY IN MALES, 15 TO 34 YEARS, AND SOCIAL AND ENVIRONMENTAL FACTORS IN THIRTY COUNTY BOROUGHS, 1931-33

	Variable held constant	r	Standard error	t	
Heart disease mortality and social index	Persons per room	+0·39	±0·16	2·21	0·02<P<·05
Heart disease mortality and social index	Proportion at more than 2 persons per room	+0·42	±0·15	2·44	0·01<P<·02
Heart disease mortality and social index	Latitude	+0·30	±0·17	1·62	0·1<P<·2
Heart disease mortality and latitude	Social index	+0·36	±0·16	2·01	0·05<P<·1
Heart disease mortality and latitude	Persons per room	+0·45	±0·15	2·59	0·01<P<·02
Heart disease mortality and latitude	Proportion at more than 2 persons per room	+0·47	±0·14	2·74	0·01<P<·02
Heart disease mortality and persons per room	Social index	+0·01	±0·18	0·06	0·3<P
Heart disease mortality and persons per room	Latitude	+0·10	±0·18	0·50	0·3<P
Heart disease mortality and proportion at more than 2 persons per room	Social index	−0·02	±0·18	−0·09	0·3<P
Heart disease mortality and proportion at more than 2 persons per room	Latitude	−0·03	±0·18	−0·18	0·3<P

TABLE XI

PARTIAL CORRELATION COEFFICIENTS BETWEEN HEART DISEASE MORTALITY IN FEMALES, 15 TO 34 YEARS, AND SOCIAL AND ENVIRONMENTAL FACTORS IN THIRTY COUNTY BOROUGHS, 1931-33

	Variable held constant	r	Standard error	t	
Heart disease mortality and social index	Persons per room	+0·47	±0·14	2·73	0·01<P<·02
Heart disease mortality and social index	Proportion at more than 2 persons per room	+0·53	±0·13	3·29	P<·01
Heart disease mortality and social index	Latitude	+0·39	±0·15	2·23	0·02<P<·05
Heart disease mortality and latitude	Social index	+0·30	±0·17	1·64	0·1<P<·2
Heart disease mortality and latitude	Persons per room	+0·41	±0·15	2·36	0·02<P<·05
Heart disease mortality and latitude	Proportion at more than 2 persons per room	+0·47	±0·14	2·77	0·01<P<·02
Heart disease mortality and persons per room	Social index	−0·02	±0·18	−0·11	0·3<P
Heart disease mortality and persons per room	Latitude	+0·13	±0·18	0·68	0·3<P
Heart disease mortality and proportion at more than 2 persons per room	Social index	−0·15	±0·18	−0·78	0·3<P
Heart disease mortality and proportion at more than 2 persons per room	Latitude	−0·09	±0·18	−0·49	0·3<P

TABLE XII

UNWEIGHTED AVERAGE MORTALITY RATE PER MILLION FROM HEART DISEASE, AGES 15 TO 34 YEARS, 1931-33, IN THIRTY COUNTY BOROUGHS GROUPED ACCORDING TO THEIR SOCIAL INDICES AND LATITUDE

	Males			Females		
	Social index			Social index		
	Under 350	350-399	Over 400	Under 350	350-399	Over 400
Latitude S. of 52° N. ..	166	218	251	241	261	432
Latitude 52° N.-53° 20′ N. ..	212	267	346	270	297	381
Latitude N. of 53° 20′ N. ..	290	265	281	352	374	379

similar problems is the absence of a reliable method of accurately measuring such fundamental features as poverty and housing conditions, though there is good reason to suspect their influence. Until the indices of social and environmental conditions are improved the true measures of associations must remain undetermined.

SUMMARY

An analysis has been made for England and Wales, and its administrative areas, of the mortality at ages 5 to 14, 15 to 24, and 25 to 34 years due to rheumatic fever and heart disease, the preponderance of the latter at these ages being directly attributable to rheumatic fever. Between 1921-23 and 1936-38, the period of years covered by this study, the total mortality from rheumatic fever and heart disease shows a substantial decline for both sexes at the school ages 5 to 14. On the other hand, at the ages of adolescence and young adult life, 15 to 34, the fall in mortality has been very slight and disappointing since 1924-26. This trend (measured on heart disease only) is uniformly apparent in the aggregates of each of the broad administrative areas of the country—county boroughs, urban districts, rural districts. The County of London reveals a rather divergent experience. From a relatively high level in 1920-22 its death rates, particularly at ages 5 to 14 and 15 to 24, have shown a greater degree of improvement than the rest of the country. It is not possible to attribute this to the operation of the Special Scheme introduced by the London County Council, since the fall in mortality has been equally great in areas of Greater London outside this Scheme. It appears, therefore, to be a local change, not easily explained.

In general, mortality increases with the degree of urbanization, the rates for rural areas being appreciably below those of the large towns, and it falls more heavily on girls and young women than on boys and young men. The mortality from heart disease at ages 15 to 34 in thirty large towns has been correlated with indices of their social and environmental features. No relationship is apparent between mortality and overcrowding, but a moderate degree of association is found between the death rate and the proportion of employed males belonging to the lowest social classes and with the latitude of the city.

I wish to thank Prof. A. Bradford Hill for much helpful advice, and Mrs. Young who kindly drew the diagrams.

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REVIEW

Population Policy in Great Britain. A Report by P.E.P. 1948. Published by P.E.P. (Political and Economic Planning), 16 Queen Anne's Gate, London, S.W.1. 1948. Pp. 228, 24 tables, and 9 charts. (Price 15*s*.)

The organization known as P.E.P. has earned for itself a sound reputation as a fact-finding body and has produced a considerable number and variety of pamphlets and books which have commanded the respect and gratitude of the social scientists and of all who are interested in the affairs of our society. No publication of P.E.P. can claim greater interest or importance than the one now being considered.

The public health, the health of the population, the wellbeing of an organized society, can be measured by the use of certain demographic yardsticks. Movements of the birthrate, deathrate, natural increase, and fertility rate, are reflections of the reactions of human beings to circumstances and conditions within their external world. This book is a comprehensive, fully documented, and simply presented account of population trends in this country associated with a fair, frank, and objective consideration of what these trends mean to us as a people and to our government. The book ends with a series of suggestions concerning the policy to be adopted and the actions to be taken if it be decided that it is desirable that the quantity and quality of the British people shall be at least maintained.

There is little that is peculiarly new in this book either in respect of factual information or of interpretation, but there is no other book of recent appearance which presents so complete an account of this particular subject, for in it are integrated and synthesized the results of the labours and ponderings of the many who in recent years have written upon it.

Emerging from the argument concerning population trends and the retreat from parenthood is the decision that the objective of a population policy in so far as this country is concerned must be to achieve a stable fertility at a level involving an average number of about 2·5 children in each family, which means of course that a considerable number of families must include 4 or 5 children. The methods to be adopted for the achievement of this objective are then set out in detail: maternity grants, family allowances (which it is suggested should be doubled), social insurance, tax rebates, the provision of suitable houses, and other environmental health services. It is clearly recognized that the removal of the economic burdens of parentage are not in themselves sufficient to persuade people to increase the size of their families. The main proposal in this Report relates to the new Health Service, from which much is expected. It is suggested that to the Minister of Health should be given an additional portfolio of Minister of Population, and that within the National Health Service there should be an organized Family Welfare Service in which the general practitioner of medicine would be the adviser of those about to marry and the guardian of the child yet to be conceived.

There is no doubt that for the present the recommendations made in this Report are far in advance of public opinion and of the ability on the part of the profession of medicine to give effect to them. The Report is strongly to be recommended, however, to all who are directly or indirectly concerned with the maintenance and augmentation of the health of the people, especially to such as are concerned with programmes of planned migration and of the relief of manpower shortage in this country by the importation of displaced persons. It should be regarded as an argument in favour of the institution of a positive population policy and the reader should continuously attempt to refute its arguments, although not of course by the reiteration of some peculiar and precious prejudice. The open-minded, if there be such, will find it difficult to reach conclusions markedly different from those which this book presents.

F. A. E. Crew

ABSTRACTS

(This section of the JOURNAL *is devoted to selected abstracts of articles on social medicine appearing in the current literature. The section will be edited in collaboration with the two abstracting Journals,* Abstracts of World Medicine, *and* Abstracts of Surgery, Obstetrics and Gynaecology.)

Statistics of Stillbirth and Early Neonatal Death (Statistiques de mortinatalité et de mortalité précoce. (Année 1947).) LÉVY-SOLAL, M., and LAUTMANN, —. (1948). *Gynec. et Obstet.*, **47**, 302.

The authors present the 1947 statistics of neonatal death and death in early infancy for the Baudelocque Maternity Hospital, Paris. They refer to 3,687 births; 83 (2·27 per cent.) babies were macerated or stillborn, and 35 (0·97 per cent.) died in the first 12 days. It is specified that no child weighing under 2,500 g. is discharged from the hospital; 255 of those born alive were under this weight.

There still is no general agreement in France as regards the definition of stillbirth and early neonatal mortality, that is, death in the first 72 hours of infancy. An international ruling would be welcome. Neither is there a specific definition of the term " debility " (immaturity), weight still being the main criterion for this condition, although certain infants of under 2,500 g. weight appear healthy and vigorous, while others seem hypotonic and are difficult to rear. Mortality in the first 12 days (35 cases) was due to obstetric trauma (6), malformations (7), immaturity (14), toxicosis or diarrhoea (3), Rh-incompatibility (2), and various other causes (3). Of these children, 26 weighed less than 2,500 g. The importance of otitis media is stressed. The rare cases of pulmonary oedema quickly responded to oxygen and penicillin therapy.

Comparing their 2·27 per cent. stillbirth rate with figures for previous years, the authors believe that improvement has been considerable, because of progress in prophylaxis and treatment of syphilis, pregnancy toxaemias, disproportion, heart affections, and tuberculosis, and also because of better obstetric technique (caesarean section, resuscitation). Immature infants are isolated in special wards where they receive the classical treatment under special supervision. It is especially in improvement of care of these infants that, in the authors' opinion, better results can be obtained. *H. Godar*

Children's Hostels in War and Peace. WINNICOTT, D. W. (1948). *Brit. J. med. Psychol.*, **21**, 175.

A plea is made for the retention of hostels for difficult children in peace time, especially if the children can be under the direction of the psychiatrist who sees them in the clinics. Little new in psychological theory came out of evacuation experience, but a large number of people became aware both of the existence of, and reasons for, antisocial behaviour of children. Two broad categories of children require in peace time to be sent to hostels with specially trained staff: (1) those whose homes do not exist; (2) those whose parents cannot form a stable background in which the child can develop, and those with an existing home which contains a mentally ill parent. It is essential that the staff of hostels should be supported and advised by the psychiatrist and psychiatric social worker. In fact the staff may need more attention than the children, for, if the latter are properly placed and cared for in the right psychological environment, little other treatment may be needed. Individual psychotherapy may be needed, but it is noticeable that the better the warden or the parent the more the intrusion of the psychotherapist will be resisted or even resented. Such work is definitely prophylactic in the interests of the Home Office, whose function it is to prevent crime.

Sixteen case notes are appended as illustration; the wholesale closing down of war time hostels is deplored. Attention is drawn to the fact that practically no accommodation is available for psychotic children. " Officially they do not exist." *R. G. Gordon*

The First Ten Years of Rheumatic Infection in Childhood. ASH, R. (1948). *Amer. Heart J.*, **36**, 89.

The author analyses a follow-up study of 547 children observed for 10 years after the onset of rheumatic fever. At the end of the 10-year period over 90 per cent. of the group had been located. At the end of the initial attack 41 per cent. gave no evidence of heart disease; of these over 76 still showed no evidence of heart disease at the end of 10 years, while only 5 per cent. had died of rheumatic infection or bacterial endocarditis. Of those children with rheumatic heart disease in the initial attack, over 40 per cent. had died by the end of 10 years of rheumatic infection or bacterial endocarditis, while in just under 10 per cent. the signs of cardiac involvement had disappeared.

The results agree closely with the larger group reported earlier by Jones and Bland (*Trans. Ass. Amer. Phys.*, 1942, **57**, 265). *R. J. Grant*

Social Conflict and the Challenge to Psychology. MONEY-KYRLE, R. E. (1948). *Brit. J. med. Psychol.*, **21**, 215.

Psychologists have recently claimed that world problems are psychological as well as economic. Now that economic theories have not proved very successful, psychologists are being challenged to make good their claims. The difficulty of this lies in the difference of attitude between science and ethics. Science is neutral in its attitude and may therefore be evasive: ethics are partisan. While in individual mental health the environment is important, the underlying motives are really more important. So in social health a study of motives may also be significant and the promotion of this study may be the contribution of psychology to social sciences. A non-partisan approach to the study of motives will show how society tends to divide everything into white and black, into good and bad, and how the guilt of one side is projected into the bad (opposing) party or nation. Even people who are normally both modest and charitable in private life and easily forgive their enemies, find it much harder to criticize the party or nation with which they identify themselves and may be implacable in their moral condemnation of its opponents. Those who are unable to admit any share of blame are never able to forgive their enemies and those who are never forgiven find it still more difficult to become conscious of their guilt. Thus the denial and projection of guilt is one of the main factors in national and political vindictiveness and so tends to the perpetuation of all feuds and to political callousness and tyranny. Rapid progress cannot be expected in changing the viewpoint of individuals, but gradually more and more people may be got to think in this way. *R. G. Gordon*

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